MOTOROLA

"DISPATCHER"

MOBILE FM TWO-WAY RADIO

15 WATTS RF POWER

136-174 MC

±12 VDC

"Private-Line" Tone Squelch Radio Set

MOTOROLA INC. **Communications Division**

ENGINEERING PUBLICATIONS 4501 WEST AUGUSTA BOULEVARD CHICAGO, ILLINOIS 60651

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Issue - C

GUARANTEED PERFORMANCE SPECIFICATIONS

GENERAL

	CARRIER SQUELCH MODELS	"PRIVATE-LINE" TONE SQUELCH MODELS
MODELS	D33CMT-1100BM D33CMT-1110BM D33CMT-1130BM D33CMT-1170B	D33CMT-3100BM D33CMT-3110BM D33CMT-3130BM
MAXIMUM BATTERY DRAIN	Receive: (xmtr filaments off) less than 0.3 amp at 13.8 v d-c Receive: (xmtr filaments on) 1.8 amp at 13.8 v d-c Transmit: 8.5 amp at 13.6 v d-c	
CRYSTAL HEATER DRAIN	0.18 amp at 25°C (average)	
POWER SUPPLY	Fully transistorized; nominal 12 v d-c operation -- positive, negative ground	
METERING	A single scale, 0-50 microampere meter with 20,000 ohms series resistance or Motorola Model S1056A-9A or TU546 Portable Test Set can be used to measure all circuits essential to tuning and checking.	
FREQUENCY	136-174 mc (except 150-174 mc for D33CMT-3110BM and D33CMT-3130BM) maximum frequency separation on multiple frequency models is 300 kc	
DIMENSIONS	4-1/2" high x 11-1/4" wide x 13-5/8" long	
WEIGHT (WITH ACCESS.)	22 lbs.	

TRANSMITTER

RF POWER OUTPUT	15 watts min.	
OUTPUT IMPEDANCE	50 ohms	
SPURIOUS AND HARMONIC EMISSIONS	More than 60 db below carrier	
FREQUENCY STABILITY	Oven type unit maintains carrier within ±.0005% of assigned center frequency from -30°C to +60°C ambient (+25°C reference)	
MODULATION	16F3: ±5 kc for 100% at 1000 cps	
TUBE COMPLEMENT	8446 or 6CL8A - Oscillator & Modulator 8445 or 6EA8 - Doubler & Tripler 8448 or 12BY7A - Doubler Driver 6360 - Power Amplifier 8447 or 12BR7 - Audio Amplifier & Clipper	
AUDIO SENSITIVITY	0.165 volt ±3 db for 2/3 maximum deviation at 1000 cps	
FM NOISE	50 db below 2/3 of rated deviation at 1000 cps	
AUDIO RESPONSE	+1, -3 db of 6 db/octave pre-emphasis characteristic from 300 to 3000 cps	+1, -6 db of 6db/octave pre-emphasis characteristic from 300 to 3000 cps
AUDIO DISTORTION	Less than 5% at 2/3 of rated deviation	

RECEIVER

CHANNEL SPACING	30 kc	
SELECTIVITY	20 db quieting more than -90 db at ±15 kc; EIA-SINAD: more than -80 db at ±30 kc	
MODULATION ACCEPTANCE	±6 kc minimum	
SENSITIVITY	20 db quieting: 0.5 uv maximum; EIA-SINAD: 0.35 uv	
SEMICONDUCTOR COMPLEMENT	17 transistors and 8 diodes	
FREQUENCY STABILITY	Crystal maintains oscillator frequency within ±.0005% of assigned center frequency from -30°C to +60°C ambient (+25°C reference)	
SPURIOUS AND IMAGE REJECTION	More than 86 db down	
SQUELCH	Noise compensated type, adjustable sensitivity, threshold sensitivity of 0.25 microvolt	Noise compensated type, adjustable sensitivity, threshold sensitivity of 0.25 microvolt. Also includes a tone operated squelch circuit with a fixed sensitivity of 0.25 microvolt.
AUDIO OUTPUT	5 watts to a 3.2 ohm load measured at the receiver output at less than 10% distortion	
AUDIO RESPONSE	+2, -8 db of 6 db/octave de-emphasis characteristic from 300 to 3000 cps	

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

FCC LICENSE DESIGNATION: CC3027

FOREWORD

NOMENCLATURE

Motorola mobile radio equipment is packaged as a radio set plus accessories. The radio set is specifically identified by the model number on the nameplate.

NOTE

Be sure to use the entire model number when making inquiries about your equipment.

The accessories are identified by an accessory group number which includes the other items essential to completing the radio installation such as; antenna, cables, etc. Use this number when referring to a specific group of accessories.

Identifiers have been assigned to chassis and kits. Use these identifiers when requesting information or ordering replacements.

Radio set and accessory groups charts are located in the front of this manual.

PRODUCTION CHANGES

When production and engineering changes are incorporated into the equipment, a revision numeral is assigned to the chassis or kit affected.

Typical Example:

A Model TUD1110BB Chassis becomes TUD1110BB-1 with the first revision.

This chassis number complete with revision numeral, if any, is stamped on the chassis at the time of production. The revision numeral becomes an integral part of the chassis identifier.

A schematic diagram number complete with its issue letter is also stamped on each chassis. This establishes direct correlation between the chassis and its schematic. The schematic issue is advanced each time a change occurs in the chassis.

INSTRUCTION MANUAL REVISIONS

Changes which occur after an instruction manual is printed are described in the Instruction Manual Revisions. These bulletins give the reader complete information on the change including pertinent parts listing data.

NATIONAL SERVICE ORGANIZATION

Motorola provides a nation-wide service organization. Through its maintenance and installation program Motorola makes available the finest service to those desiring reliable continuous communications on a contract basis.

The largest service organization specializing in mobile communications is Motorola's National Service Organization. Over 800 strategically located, adequately staffed and trained, independently owned and operated stations, manned with several thousand FCC licensed personnel constitute the sub-contracting force.

The administrative forces of area and district service managers and district service representatives are in the direct employ of Motorola.

For your contract service requirements, please contact your local Motorola representative or write to:

National Service Manager
Motorola Communications Division
4501 W. Augusta Blvd., Chicago, Illinois 60651

REPLACEMENT PARTS ORDERING

Motorola maintains parts and service depots and authorized service stations strategically located through the country. These facilities are fully equipped to give the finest service.

When ordering replacement parts, the complete number identification of the item must be used whether it be a component, kit or complete chassis. This will fix proper identification and insure receipt of the desired item. Complete number identification should also be used when requesting equipment information.

Channel element orders should specify type number, crystal frequency, carrier frequency and the chassis model number in which the channel element is to be used.

Orders for "Vibrasender" and "Vibraspondder" units should specify the type number and frequency and should identify the owner and operator of the communications system in which these items are to be used.

68P81009A99-G

CAREFUL USE OF THE INSTRUCTION MANUAL AND THE MANY INSTRUCTIONS CONTAINED IN IT WILL FURTHER INSURE PROPERLY INSTALLED AND MAINTAINED RADIO EQUIPMENT.

THE EQUIPMENT DESCRIBED IN THIS MANUAL IS MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING MOTOROLA U.S. PATENTS:

RE-24,110	2,691,560	2,833,994	2,994,844	3,087,999
RE-24,815	2,699,425	2,834,879	3,002,146	3,091,736
2,524,300	2,705,281	2,835,794	3,009,115	3,094,293
2,524,534	2,731,555	2,883,521	3,014,127	3,101,441
2,547,023	2,738,466	2,888,652	3,027,454	3,119,093
2,547,025	2,740,891	2,899,547	3,027,455	3,126,514
2,547,027	2,743,144	2,901,601	3,039,081	3,128,431
2,583,032	2,743,361	2,912,573	3,041,550	3,129,396
2,602,842	2,759,052	2,918,571	3,048,659	3,131,354
2,608,648	2,759,103	2,924,705	3,048,747	3,149,317
2,608,649	2,777,950	2,925,562	3,059,184	3,175,183
2,626,384	2,784,263	2,938,082	3,061,785	3,175,187
2,637,782	2,799,010	2,963,577	3,070,737	3,175,193
2,650,333	2,808,507	2,966,585	3,070,748	3,183,382
2,662,942	2,809,236	2,968,739	3,083,332	3,191,123
2,688,059	2,810,068	2,974,221	3,087,117	3,204,202
2,691,094	2,830,200	2,984,740	3,087,998	3,205,455

Other U.S. Patents Pending

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MOTOROLA

RADIO SET MODEL CHART

CODE:

- [X] = ONE ITEM SUPPLIED
- [O] = ONE ITEM SUPPLIED PER FIVE OR LESS RADIO SETS
- [/] = ONE ITEM SUPPLIED DEPENDENT UPON FREQUENCY
- [2] = TWO ITEMS SUPPLIED DEPENDENT UPON FREQUENCY

ITEM	DESCRIPTION	REFERENCE DIAGRAM	MODEL NUMBER: D33CMT-1100BM	D33CMT-1110BM	D33CMT-1130BM	D33CMT-1170B	D33CMT-3100BM	D33CMT-3110BM	D33CMT-3130BM
	NO. OF RCVR. FREQ.		1	1	2	4	1	1	2
	NO OF XMTR. FREQ.		1	2	2	4	1	2	2
	CARRIER SQUELCH MODELS		1	1	2	4	"PRIVATE-LINE" TONE SQUELCH MODELS		
TUD1110BB	UNIFIED CHASSIS, CARRIER SQUELCH, 1 & 2 FREQUENCY		X	X	X				
TUD1130BB	UNIFIED CHASSIS, CARRIER SQUELCH, 4-FREQUENCY					X			
TUD1120BB	UNIFIED CHASSIS, 1 & 2 FREQUENCY , DUAL SQUELCH						X	X	X
TLD6321A	RECEIVER RF DECK (136-150.8 MC)		/	/	/	/	/	/	/
TLD6322A	RECEIVER RF DECK (150.8-162 MC)		/	/	/	/	/	/	/
TLD6323A	RECEIVER RF DECK (162-174 MC)		/	/	/	/	/	/	/
TLN6706A	2-FREQUENCY TRANSMITTER KIT			X				X	
TLN6707A	2-FREQUENCY TRANSMITTER & RECEIVER KIT				X				X
TLN6451A	ESCUTCHEON KIT; CARRIER SQUELCH, 1-FREQUENCY		X						
TLN6452A	ESCUTCHEON KIT; CARRIER SQUELCH, 2-FREQUENCY			X	X				
TLN6453A	ESCUTCHEON KIT; 1-FREQUENCY, DUAL SQUELCH						X		
TLN6454A	ESCUTCHEON KIT; 2-FREQUENCY, DUAL SQUELCH							X	X
TLN6719A	ESCUTCHEON KIT; CARRIER SQUELCH, 4-FREQUENCY					X			
TLN6657A	MOUNTING HARDWARE, 1 & 2 FREQUENCY		X	X	X	X			
TLN6726A	MOUNTING HARDWARE, 4-FREQUENCY						X	X	X
TMN6019A	MICROPHONE		X	X	X		X	X	X
THN6028A	HOUSING 1 & 2 FREQUENCY		X	X	X		X	X	X
THN6052A	HOUSING, 4-FREQUENCY					X			
TLN6658A	TUNING TOOL KIT		O	O	O	O	O	O	O
TLN6824A	"VIBRASENDER" UNIT (TLN6824AA 67-150 cps, TLN6824AB 150-230 cps)						X	X	X
TU333AL	"VIBRASPONDER" RESONANT REED						X	X	X
ZNN-3A	CRYSTAL, TRANSMITTER CONTROL, 1-FREQUENCY		X				X		
ZNN-3-3A	CRYSTAL, TRANSMITTER CONTROL, 2-FREQUENCY			X	X	2		X	X
ZMM-66A	CRYSTAL, RECEIVER CONTROL, 1-FREQUENCY, (136-150.8 MC)			/	/		/		
ZMM-50A	CRYSTAL, RECEIVER CONTROL, 1-FREQUENCY, (150.8-174 MC)			/	/		/	X	
ZMM-66-66A	CRYSTAL, RECEIVER CONTROL, 2-FREQUENCY, (136-150.8 MC)				/	2			
ZMM-50-50A	CRYSTAL, RECEIVER CONTROL, 2-FREQUENCY, (150.8-174 MC)				/	2			X
G04	CRYSTAL, RECEIVER IF		X	X	X	X	X	X	X

EPD-11355-A

MOTOROLA

ACCESSORY GROUP CHART

CODE:

[X] = ONE ITEM SUPPLIED

[/] = ONE ITEM SUPPLIED; DEPENDENT UPON FREQUENCY

GROUP NUMBER	DESCRIPTION	TAD6060A	TU316-L	TU316-M	TU316-H	TKN6100A	TLN6380A	TLN6473A	TMN6013A
	ITEM DESCRIPTION	ANTENNA, 132-144 MC	ANTENNA, 144-152 MC	ANTENNA, 152-162 MC	ANTENNA, 162-174 MC	CABLE KIT	INSTALLATION KIT	RIGHT ANGLE ANTENNA CONNECTOR KIT	MICROPHONE
BM1150B	ACCESSORY GROUP WITH ANTENNA	/	/	/	/	X	X	X	
BM1152B	ACCESSORY GROUP LESS ANTENNA					X	X		
BM1155BM	ACCESSORY GROUP WITH ANTENNA AND MICROPHONE	/	/	/	/	X	X	X	X
BM1157BM	ACCESSORY GROUP WITH MICROPHONE LESS ANTENNA					X	X		X

EPD-9353-D

DESCRIPTION

The Motorola two-way radio sets described in this instruction manual feature fully transistorized receivers, power supplies, and 15 watt tube type transmitters and are intended for dash mounting in vehicles with positive or negative ground 12-volt electrical systems. The radio set includes a speaker, microphone, (except 4-frequency model) and the necessary controls for proper operation. The antenna, power cable, and installation kit (microphone for 4-frequency model) are contained in a separate accessory group. Refer to the Accessory Chart in this manual for a listing of these items.

Carrier squelch models are available in 1, 2, or 4-frequency versions. "Private-Line" tone squelch models are available in 1 or 2-frequency versions. The Model Chart in this manual lists the variations available in these basic models in addition to their radio set complement.

Carrier squelch models are muted (squelched) until they receive an on-frequency signal. A noise-actuated squelch circuit in the receiver eliminates any undesirable noise between reception periods.

"Private-Line" tone squelch models permit several "Private-Line" networks to operate on the same carrier frequency in the same area with the advantage that each network receives only the messages relating to its own activities. This is accomplished by modulating the transmitters in the "Private-Line" network with a sub-audio tone in addition to the voice modulation. The sub-audio tone is different for each network. The receiver in the "Private-Line" network will pass only correctly tone coded signals for that particular network. The operator may monitor the channel before transmitting by disabling the "Private-Line" feature (PL ON-OFF switch in OFF position). These models also include a noise-actuated squelch circuit similar to that in carrier squelch models.

The radio sets include a "battery saver" feature which removes the power from the transmitter filaments and associated power supply when the radio set is used for receive operation only. The battery saver feature frequently eliminates the need for special generators and engine idling to supply current for radio set operation. The transmitter filaments and power supply are wired through the vehicle ignition switch, while the receiver power is taken from the battery directly. Therefore with the ignition switch "off" and the radio set "on", the battery is used for the receiver only.

Transmitter and receiver metering receptacles facilitate convenient metering of all circuits essential to tuning and checking. Polarity reversing plugs, located on top of the chassis, adapt the radio set for either positive or negative ground electrical systems.

INSTALLATION AND OPERATION

1. INSTALLATION

Refer to the INSTALLATION AND OPERATION instructions packed with the installation kit.

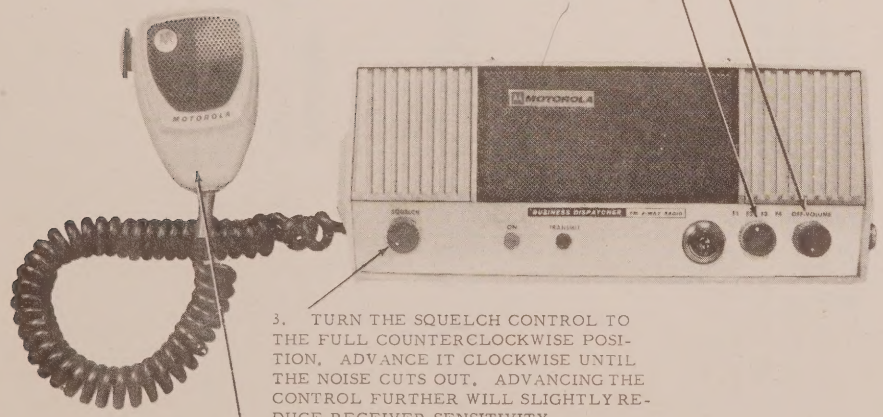
CAUTION

Make sure the polarity reversing plugs on top of the chassis next to the power transformer are in the correct position before installing the radio set.

CARRIER SQUELCH MODELS

1. TURN THE OFF-VOLUME CONTROL CLOCKWISE TO THE DESIRED LOUDNESS. THE GREEN LAMP WILL GO ON INDICATING THAT THE RECEIVER IS IN THE "STANDBY" CONDITION.

2. SELECT THE DESIRED OPERATING FREQUENCY. (MULTIPLE FREQUENCY MODELS ONLY.)



3. TURN THE SQUELCH CONTROL TO THE FULL COUNTERCLOCKWISE POSITION. ADVANCE IT CLOCKWISE UNTIL THE NOISE CUTS OUT. ADVANCING THE CONTROL FURTHER WILL SLIGHTLY REDUCE RECEIVER SENSITIVITY.

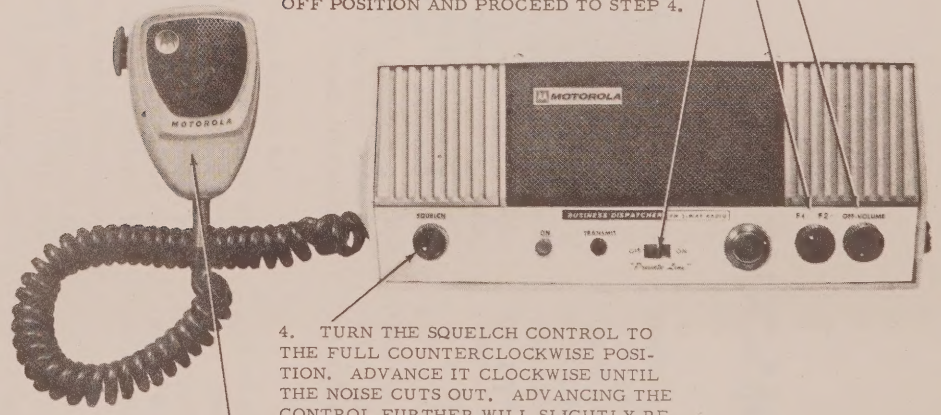
4. TO TRANSMIT TURN "ON" THE VEHICLE IGNITION SWITCH AND ALLOW 45 SECONDS FOR THE TRANSMITTER TUBES TO WARM UP. FOR SHORT TRANSMISSIONS IT IS NOT NECESSARY TO START THE ENGINE; HOWEVER TO CONSERVE THE BATTERY, THE ENGINE SHOULD BE RUNNING. HOLD THE MICROPHONE ABOUT ONE INCH AND TURNED ABOUT 30° AWAY FROM THE FACE. PRESS THE PUSH-TO-TALK BUTTON. THE RED LAMP WILL COME ON AND THE TRANSMITTER WILL GO "ON THE AIR". SPEAK SLOWLY AND CLEARLY ACROSS THE MICROPHONE IN A NORMAL OR SLIGHTLY LOUDER THAN NORMAL VOICE. AT THE END OF THE MESSAGE, RELEASE THE PUSH-TO-TALK BUTTON.

DUAL SQUELCH MODELS

1. TURN THE OFF-VOLUME CONTROL CLOCKWISE TO THE DESIRED LOUDNESS. THE GREEN LAMP WILL GO ON INDICATING THAT THE RECEIVER IS IN THE "STANDBY" CONDITION.

2. SELECT THE DESIRED OPERATING FREQUENCY. (MULTIPLE FREQUENCY MODELS ONLY.)

3. IF "PRIVATE-LINE" OPERATION IS DESIRED SET THE PL SWITCH TO THE ON POSITION AND PROCEED TO STEP 5. FOR "STANDARD" (CARRIER) SQUELCH OPERATION SET THE PL SWITCH TO THE OFF POSITION AND PROCEED TO STEP 4.



4. TURN THE SQUELCH CONTROL TO THE FULL COUNTERCLOCKWISE POSITION. ADVANCE IT CLOCKWISE UNTIL THE NOISE CUTS OUT. ADVANCING THE CONTROL FURTHER WILL SLIGHTLY REDUCE RECEIVER SENSITIVITY.

5. TO TRANSMIT TURN "ON" THE VEHICLE IGNITION SWITCH AND ALLOW 45 SECONDS FOR THE TRANSMITTER TUBES TO WARM UP. FOR SHORT TRANSMISSIONS IT IS NOT NECESSARY TO START THE ENGINE HOWEVER TO CONSERVE THE BATTERY, THE ENGINE SHOULD BE RUNNING. IF THE PL SWITCH IS IN THE ON POSITION MOMENTARILY PLACE IT IN THE OFF POSITION AND CHECK TO SEE THAT THE CHANNEL IS CLEAR. HOLD THE MICROPHONE ABOUT ONE INCH AND TURNED ABOUT 30° AWAY FROM THE FACE. PRESS THE PUSH-TO-TALK BUTTON. THE RED LAMP WILL COME ON AND THE TRANSMITTER WILL GO "ON THE AIR". SPEAK SLOWLY AND CLEARLY ACROSS THE MICROPHONE IN A NORMAL OR SLIGHTLY LOUDER THAN NORMAL VOICE. AT THE END OF THE MESSAGE, RELEASE THE PUSH-TO-TALK BUTTON.

MAINTENANCE

1. RECOMMENDED TEST EQUIPMENT

The following list of Motorola test equipment (or equivalent) is recommended for servicing the radio set:

Model T1130A Series FM Station Monitor
Model T1034C FM Signal Generator
Transistorized AC Voltmeter
Model S1056A-9A or TU546 Series Portable Test Set with TKN6025A Adapter Cable
DC Multimeter (11 megohm input impedance)
TEK-1A Transistorized Tone Oscillator
Model TEK-7 Adapter Kit
Model TEK-10 Cable Coupler
T1015A General Purpose or T1014B Precision Wide Band Oscilloscope
Model T1013A RF Load Resistor, r-f wattmeter or antenna
Model T1012A DC Power Supply with a TEK-15A Ripple Filter
Model TKN6100A Cable Kit (supplied with radio set)
TLN6383A Alignment Tool Kit

2. CHASSIS REMOVAL

To remove the radio set chassis assembly, unlock the key lock on the front panel, grasp both sides of the front panel and slide the chassis assembly out of the housing.

CAUTION

When servicing the radio set, do not short the receiver printed circuit boards or center shield to the main chassis or vehicle frame. Doing this may blow the receiver fuse in some installations.

3. TRANSMITTER SERVICING

a. Alignment Procedure

Instructions for aligning the transmitter are provided in the Transmitter Alignment Procedure of this manual. Refer to these instructions for all information pertaining to transmitter tuning.

b. Metering The Transmitter

A 12-pin metering receptacle is located on top of the radio set chassis adjacent to the transmitter harmonic filter for connection to a Motorola Model S1056A-9A or TU546 Series Portable Test Set. A Motorola Model TKN6025A Adapter Cable must be used to connect the portable test set to the metering socket. Typical meter readings are given in the Transmitter Alignment Procedure. If meter readings differ greatly from those in the table, check the transmitter for defective tubes or improper alignment.

c. Transmitter Tube Replacement

To replace transmitter tubes, remove the transmitter heat sink by loosening the four captive screws which hold it to the chassis. Remove the heat sink by lifting it STRAIGHT UP from the chassis.

The three inserts in the heat sink serve as heat transfers for the multiplier, doubler-driver, and PA tubes. If the inserts are tight, the tubes may be pulled from their sockets as the heat sink is removed. If this happens, carefully extract the tube from the heat sink and replace the tube in its socket. Replace the insert in the heat sink.

NOTE

If the shield on the bottom of the transmitter has been removed during servicing, be sure to replace it before reassembling the radio set.

d. IDC Control Adjustment (Transmitter Deviation)

Refer to the IDC Adjustment Procedure on the back of the Transmitter Alignment Procedure for adjustment of the IDC control.

4. RECEIVER SERVICING

NOTE

The receiver printed circuit boards and center shield are at a different d-c potential than the main chassis. All receiver voltages are measured with respect to A-.

a. Alignment Procedure

Instructions for aligning the receiver are provided in the Receiver Alignment Procedure of this manual. Refer to these instructions for all information pertaining to receiver tuning.

b. Metering The Receiver

A 12-pin metering receptacle is located on the 455 kc i-f printed circuit board for connection

to a Motorola Model S1056A-9A or TU546 Series Portable Test Set. A Motorola Model TKN6025A Adapter Cable must be used to connect the portable test set to the metering socket. Circuits that can be metered are given in the Receiver Metering Table on the Receiver Alignment Procedure.

c. 20 DB Quieting Sensitivity Check

A 20 db quieting sensitivity measurement can be used to determine whether or not the receiver is functioning properly. This measurement will indicate the level of r-f input necessary to reduce the output noise at the speaker by 20 db. The check should be made in a well shielded location in the absence of electrical interference. Proceed as follows:

(1) Connect a Motorola Transistorized AC Voltmeter (or equivalent) across the speaker terminals.

(2) With no signal (noise alone) being received, set the VOLUME control for a comfortable listening level and turn the SQUELCH control fully counterclockwise (open).

(3) Note the reading on the a-c voltmeter. This is a reference level to be used later.

(4) Apply a signal from a Motorola Model T1034C FM Signal Generator (or equivalent) to the antenna connector on the radio set. Set the signal generator to the carrier frequency.

(5) With the output of the signal generator initially at zero, increase the output until the noise is reduced to 1/10 of the value noted in step (3). For example, if step (3) reading was 1.0 volt, the step (5) reading should be 0.1 volt. The noise has thus been reduced 20 db and the receiver sensitivity in microvolts can be read on the signal generator. If the receiver is operating properly the quieting signal should be 0.5 microvolt or less.

d. Servicing Procedure

If the 20 db quieting sensitivity check indicates faulty operation of the receiver, refer to the following paragraph (4.e. Meter Readings and Servicing Checks) and check all d-c and a-c noise voltages shown on the receiver schematic diagram. Most common troubles are caused by short circuits resulting from excess solder or loose strands of wire. During servicing use caution in soldering and handling printed boards. Replacement of defective components or repair of printed circuits (very rare) should be made where incorrect voltages or resistance measurements indicate faulty circuitry. A break in a printed circuit can be easily repaired by the addition of a jumper across the break. The serviceman is cautioned not to replace transistors before a thorough check is made. The transistor is a dependable component and is not subject to frequent replacement. The transistor terminal voltages should be checked first. If these voltages are not reasonably close to the values indicated on the schematic diagram, the associated bias components should be checked. If all d-c voltages are correct, a signal should be traced through the circuit to locate any possible breaks in the signal path.

e. Meter Readings and Servicing Checks

(1) Meter readings with no carrier present (noise only).

Selector Switch Position	Reading in ua	Recorded Readings
1	0 min	
4	±1	
5	22 min	
6	10 min	

(2) Meter readings with carrier present.

Selector Switch Position	Reading in ua	RF Signal level with meter #4 exactly on "0"	Recorded Readings
1	0.5 or less	sufficient to produce 20 db quieting	
4	0 (fixed)	any level within range of generator	
5	20 min		

(3) The 1st and 2nd oscillators should produce the following outputs when no carrier is present. Measurements were made with a vacuum tube voltmeter and high impedance probe capable of reading voltages in the millivolt range. The multiplied frequency output of the 1st oscillator (measured at the base of the 1st mixer Q3) should be about 40 mv. The 5955 kc output of the 2nd oscillator (measured at the emitter of the 2nd mixer, Q5) should be about 30 mv.

(4) A 140 uv maximum (1000 cps) signal injected at the collector of audio preamplifier Q12 should produce 4 volts (5 watts) across a 3.2 ohm

load connected to the output transformer (speaker disconnected).

(5) Applying a signal as shown in the following table (through a 2000 uuf capacitor) will indicate how much applied signal in uv is necessary to produce a 10 ua reading on meter position 1 for proper receiver operation.

Frequency	Normal Input for 10 ua Reading	Signal Applied to	Recorded Readings
455 kc	215 uv	base of 1st 455 kc amplifier, Q6	
455 kc	25 uv	base of 2nd mixer, Q5	
5.5 mc	50 uv	base of 2nd mixer, Q5	
5.5 mc	20 uv	base of 1st mixer, Q3	
assigned r-f carrier	10 uv	base of 1st mixer, Q3	
assigned r-f carrier	2 uv	base of r-f amplifier, Q1	

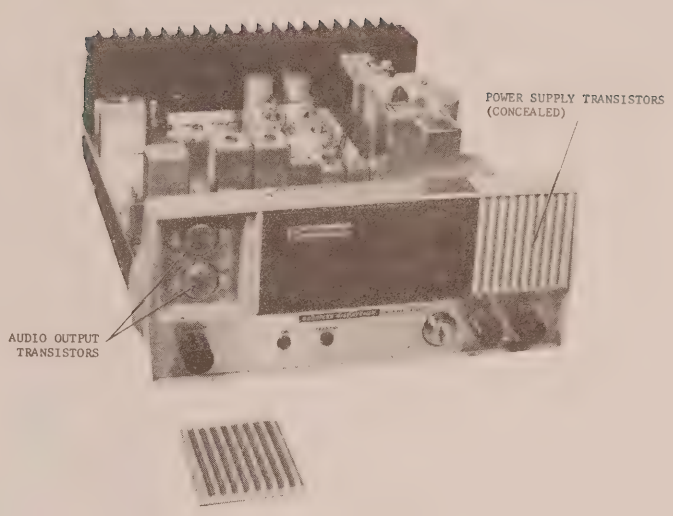
5. TRANSISTOR REPLACEMENT
(Front Panel)

Access to the power supply and receiver audio output transistors is obtained by removing the transistor cover plates at each side of the speaker. To remove a cover plate, unscrew the 6-32 hex head captive screw on the rear of the front panel, next to the transistors to be serviced. To remove a transistor, unscrew the two hex head screws which secure the transistor and pull it out (plug-in-type). Use care to prevent damage to the mica washer between the transistor panel. If the mica washer has to be replaced, it must be coated thinly with silicon grease on both sides. Place the mica washer on the new transistor; insert the transistor in the socket and secure it with two screws. Replace the cover plate.

6. FRONT PANEL CONTROL REPLACEMENT

To replace the front panel squelch and volume controls, it is necessary to remove the front panel according to the following procedure:

(1) Unsolder the BLK-YEL lead from the speaker terminal strip. Unplug the YEL lead from the same terminal strip.



(2) Remove the control knobs and the hex nuts behind them.

(3) Remove the front panel transistor cover plates and the four transistors on both sides of the speaker as described in preceding paragraph 5.

(4) Remove the two hex head screws on the front of the front panel (one at each upper outside corner of the transistor wells).

(5) Remove the key lock. To do this, remove the hex nut holding the latch, remove the latch and the hex nut under the latch.

(6) The front panel may now be removed by pulling it forward. Replace the control.

(7) Reassemble using the reverse procedure.

7. MICROPHONE REMOVAL

To disconnect a wired-in microphone, unsolder the four microphone cable leads from the chassis terminal strip. Unhook the "S" hook which secures the microphone cable to the side of the chassis. Pull the cable and grommet through the chassis.

8. PILOT LAMP REPLACEMENT

Pilot lamps may be replaced after the radio set chassis assembly has been removed from the housing. To replace a lamp, slide the socket off the bracket. Replace the lamp. Replace the lamp socket on the bracket. Note that the red pilot lamp has a sleeve that should be replaced if this lamp is removed.

9. RELAY REMOVAL

a. Carrier Squelch Models

(1) Unsolder all leads connected to the relay assembly terminals on the underside of the chassis.

(2) Remove the relay cover by removing the hex head nut which holds it to the relay.

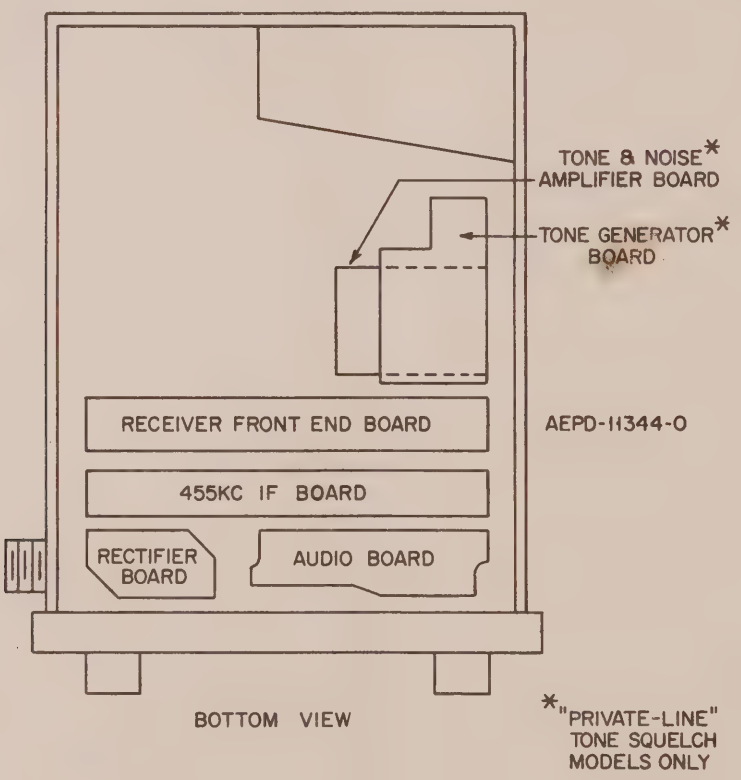
(3) The relay may be removed by removing the two hex head screws which secure it to the chassis.

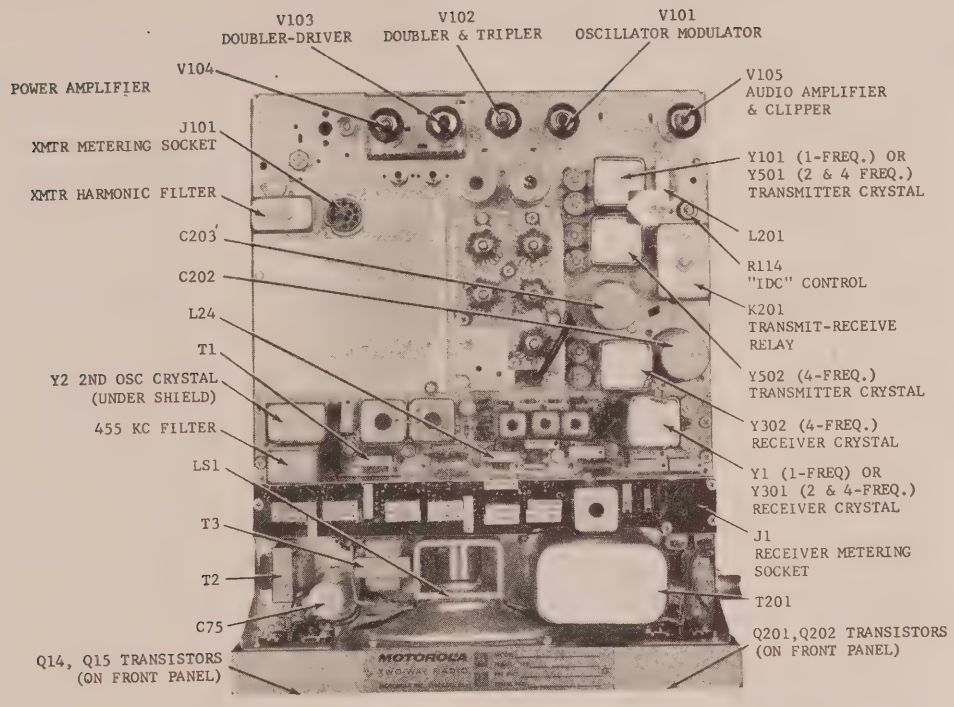
b. "Private-Line" Tone Squelch Models

(1) Remove the relay cover by removing the hex head nuts which hold it to the chassis and relay.

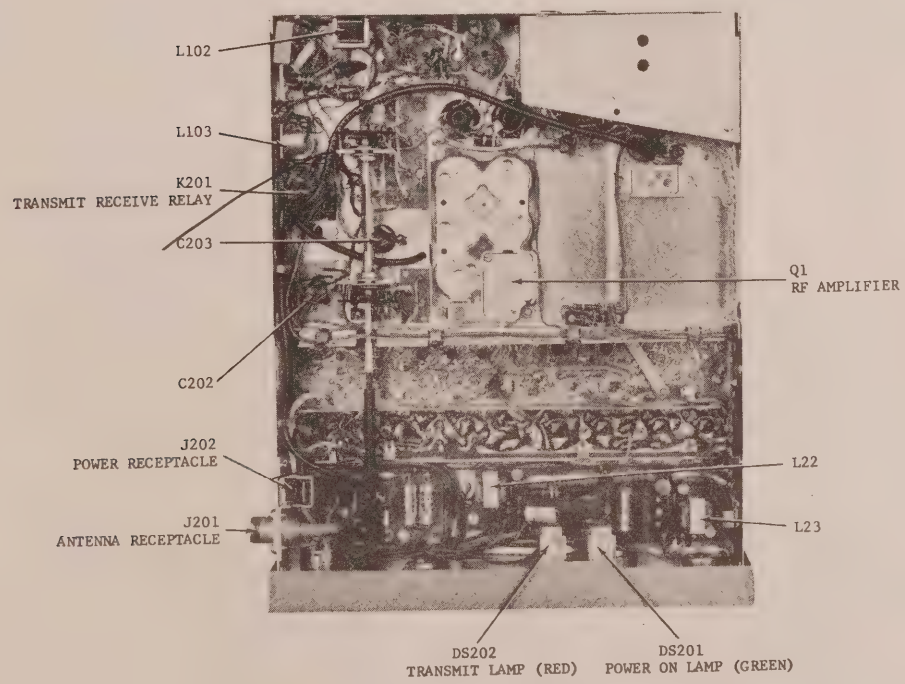
(2) Unsolder all the leads connected to the relay terminal board.

(3) Remove the two hex head screws on the underside of the chassis. The relays may now be removed from the bracket for servicing.

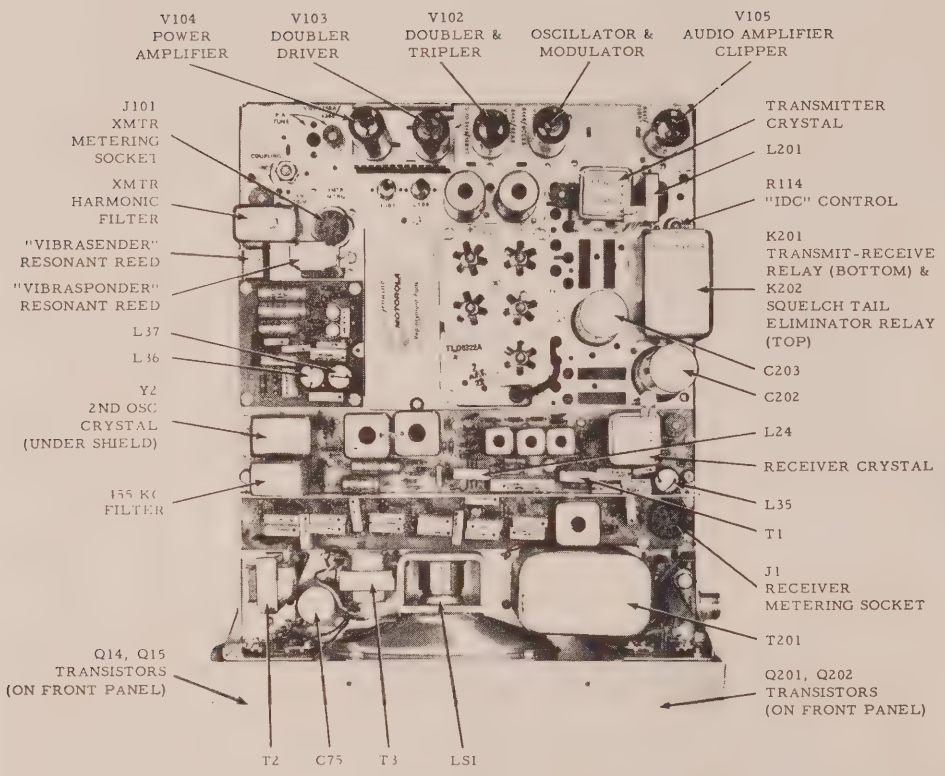




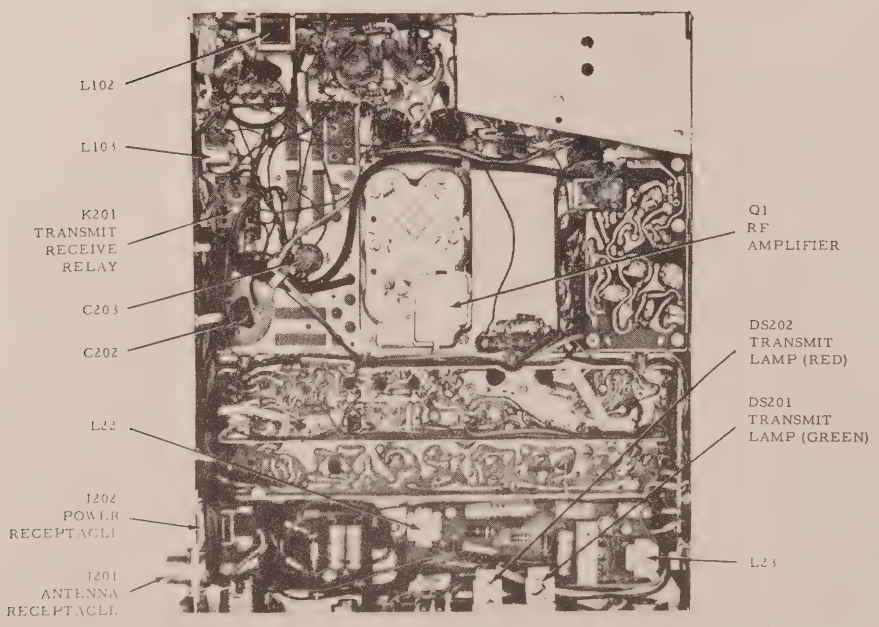
Top View



Bottom View
Carrier Squelch Models
Parts Location Detail



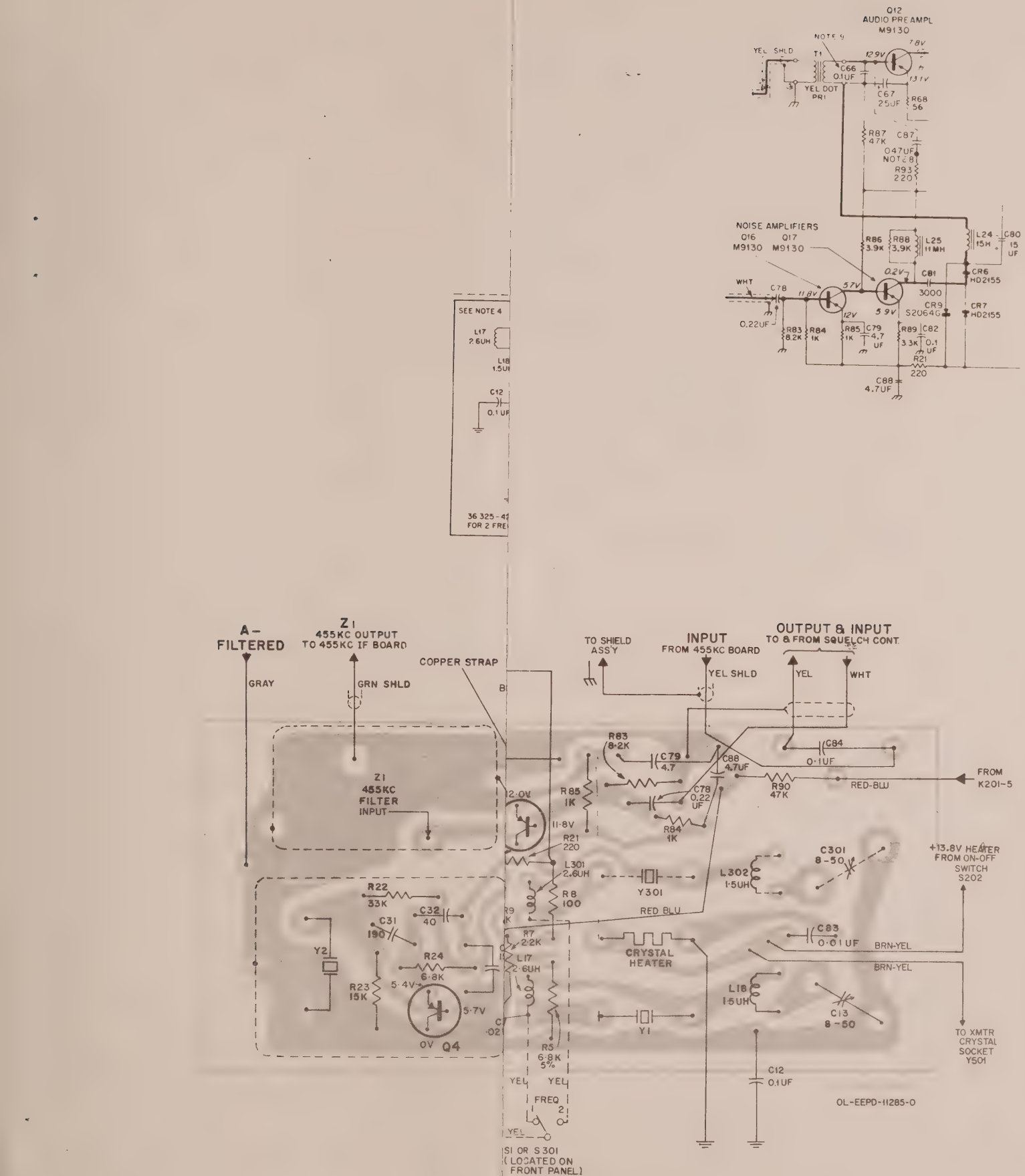
Top View



Bottom View

"Private-Line" Tone-Coded Squelch Models

Parts Location Detail

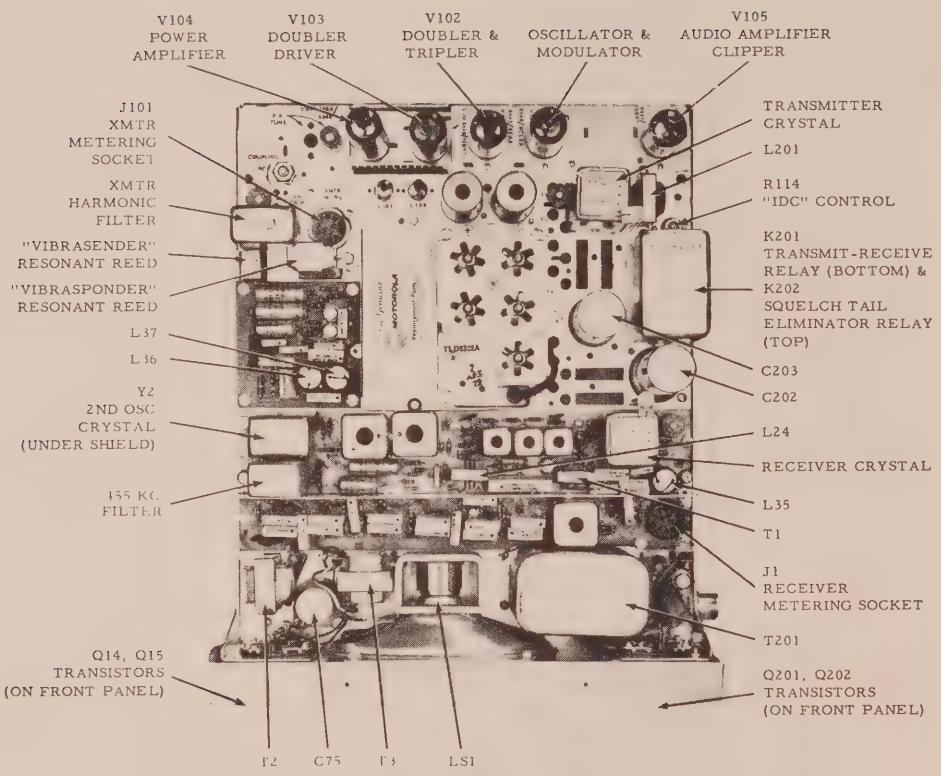


S1 OR S 301
(LOCATED ON
FRONT PANEL)

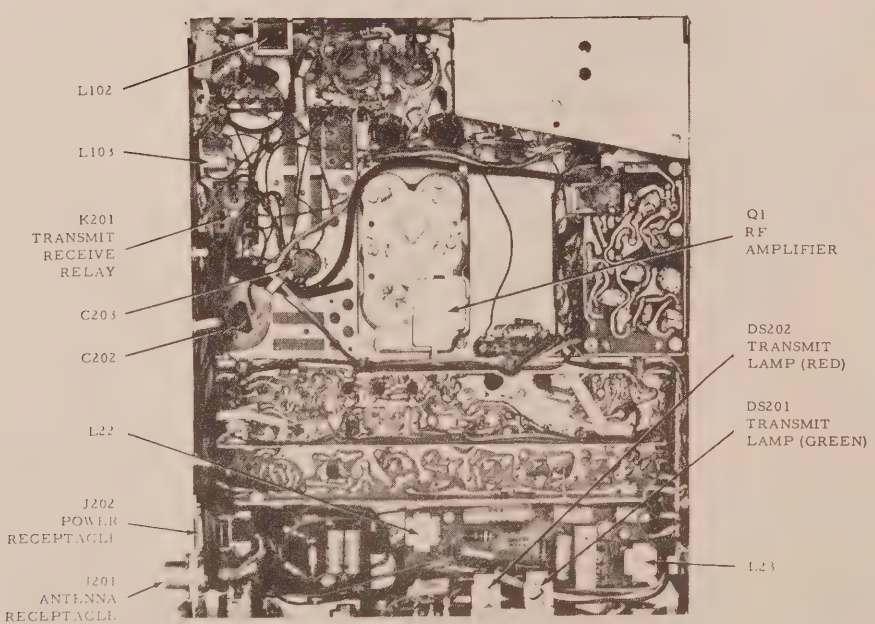
REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	
A	TLD6361B-2 TLD6362B-2 TLD6531B-2 TLD6532B-2 TLD6571B-2 TLD6572B-2	Y2	WAS G

Carrier Squelch Receiver
Models TLD6361B, TLD6362B, TLD6531B
And TLD6532B Pre-Amplifier-Demodulator
Printed Board and Wiring Diagram
Motorola No. EPD-11286-A
2/24/67-GM



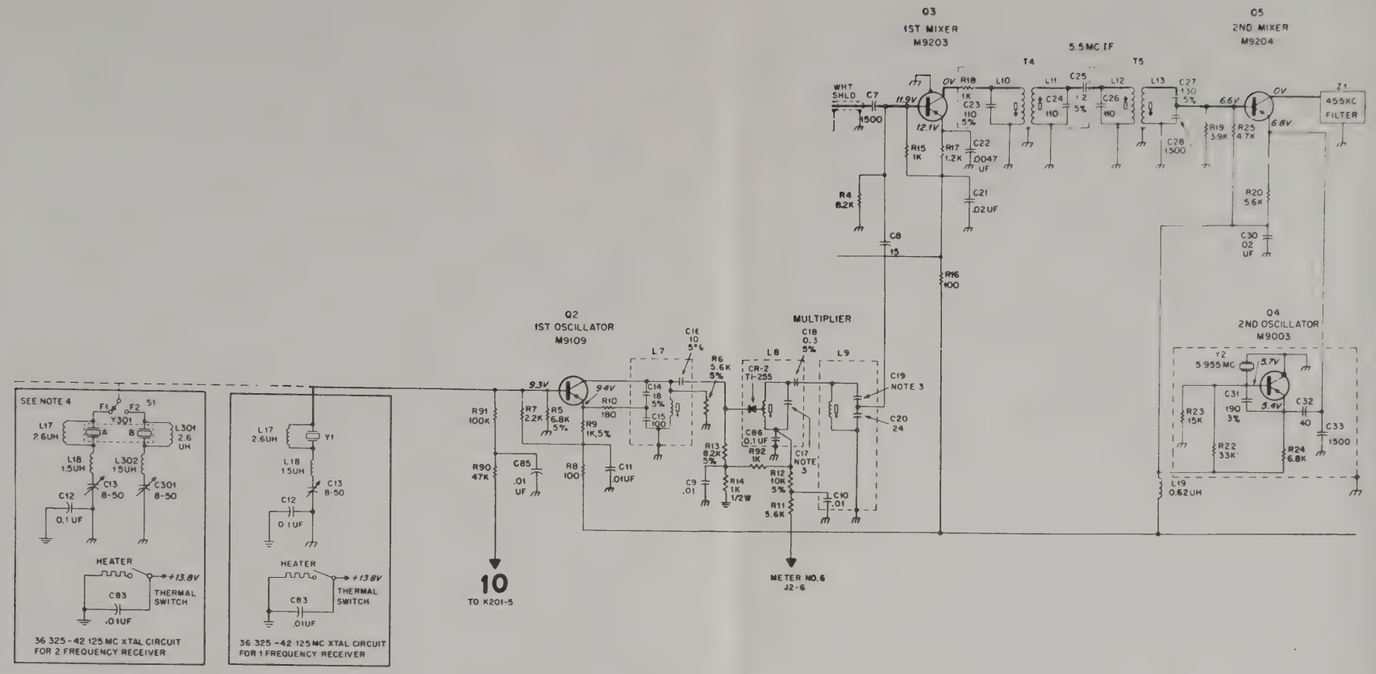
Top View

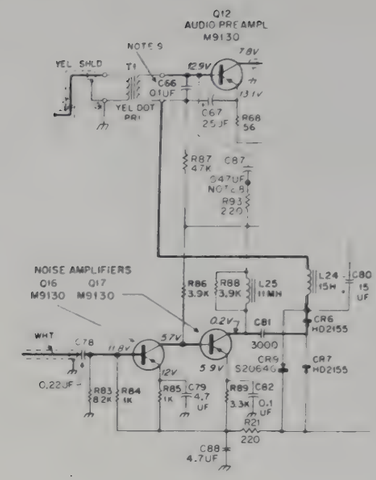


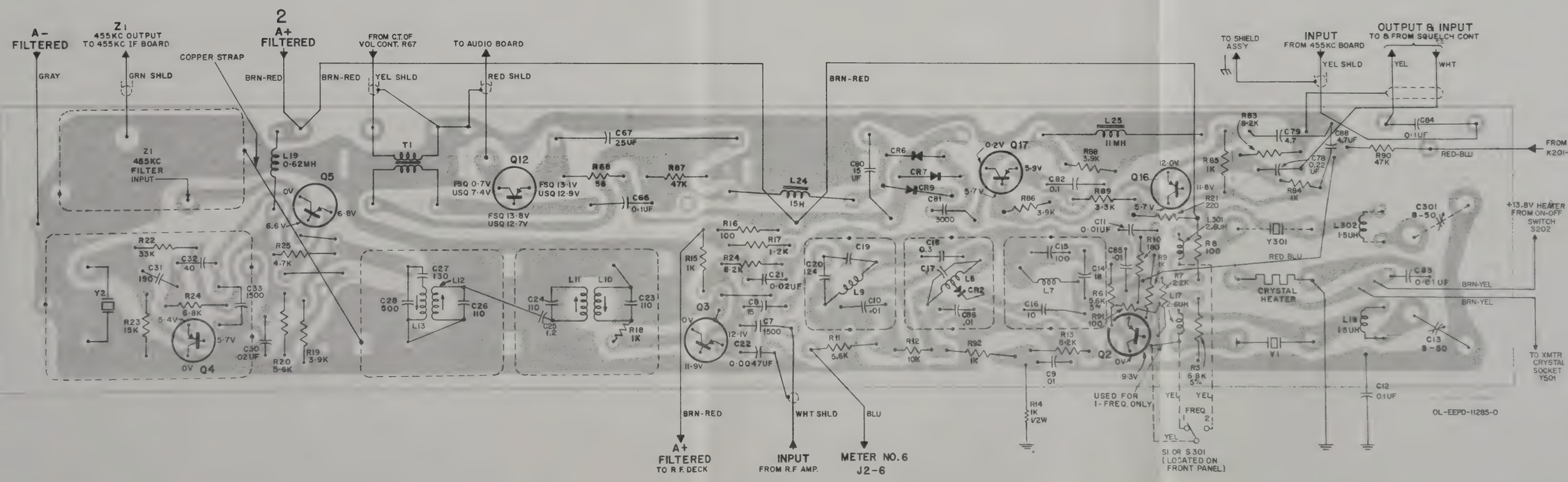
Bottom View

"Private-Line" Tone-Coded Squelch Models

Parts Location Detail



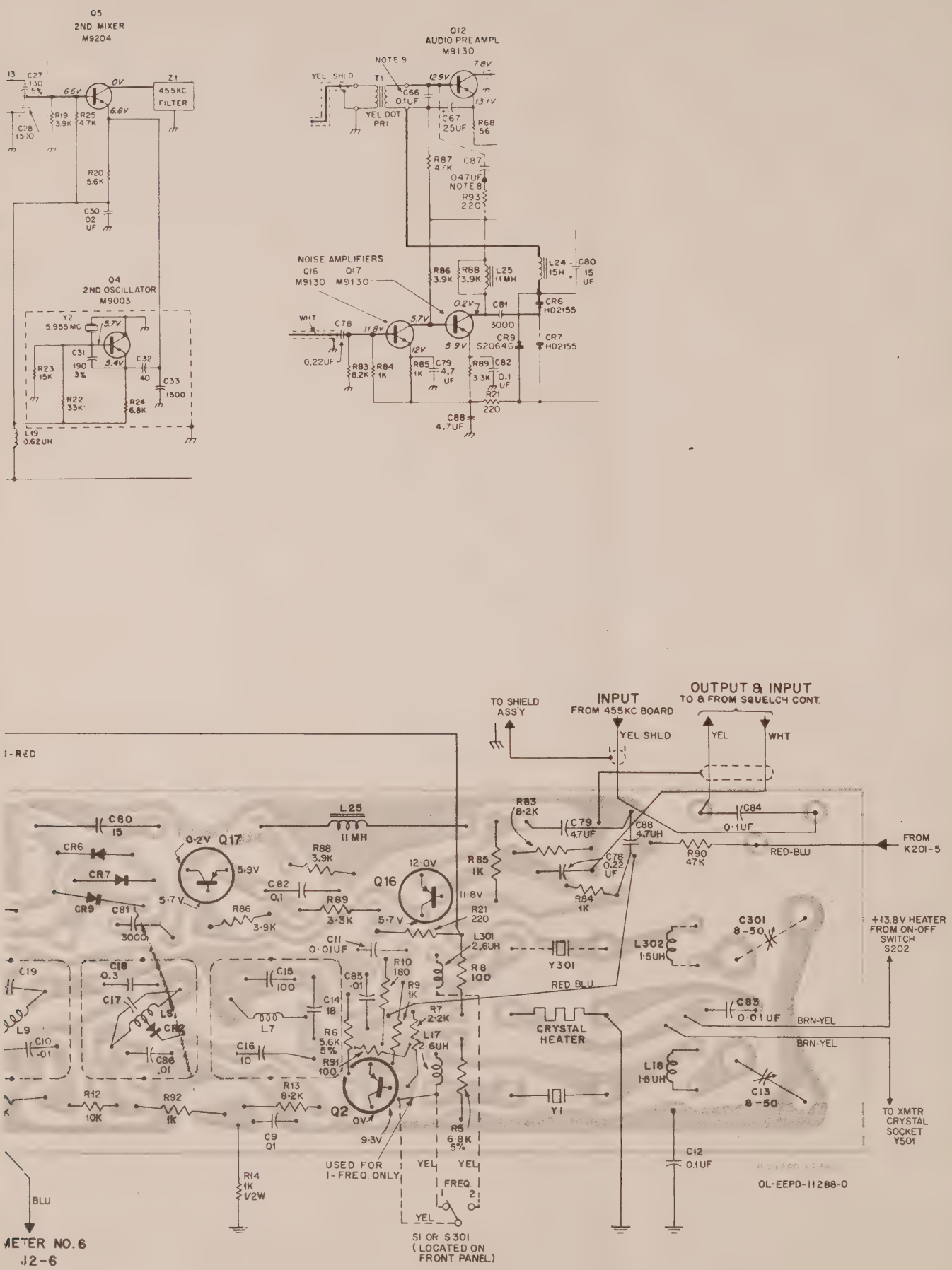




REVISIONS

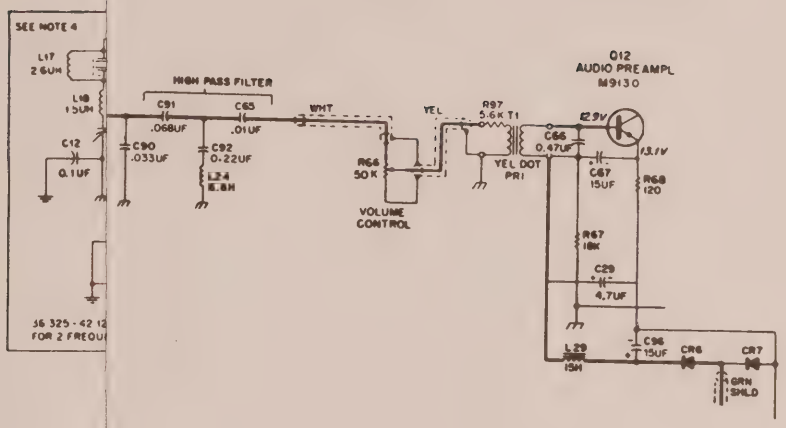
DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TLD6361B-2 TLD6362B-2 TLD6531B-2 TLD6532B-2 TLD6571B-2 TLD6572B-2	Y2	WAS G04 5.955 MC	2ND OSCIL-LATOR

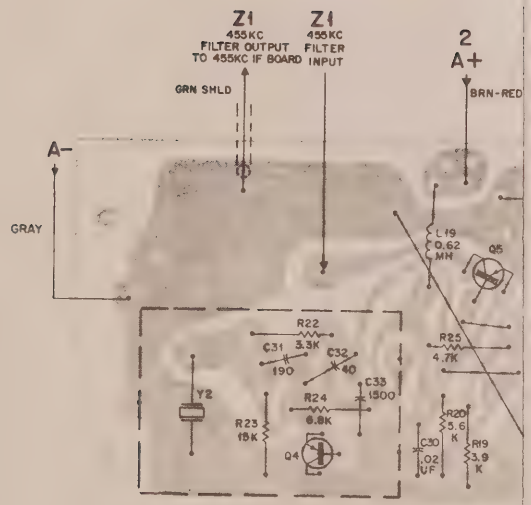
Carrier Squelch Receiver
Models TLD6361B, TLD6362B, TLD6531B
And TLD6532B Pre-Amplifier-Demodulator
Printed Board and Wiring Diagram
Motorola No. EPD-11286-A
2/24/67-GM



REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TLD6571B-2 TLD6572B-2	Y2	WAS G04 5.955 MC	2ND OSCIL-LATOR

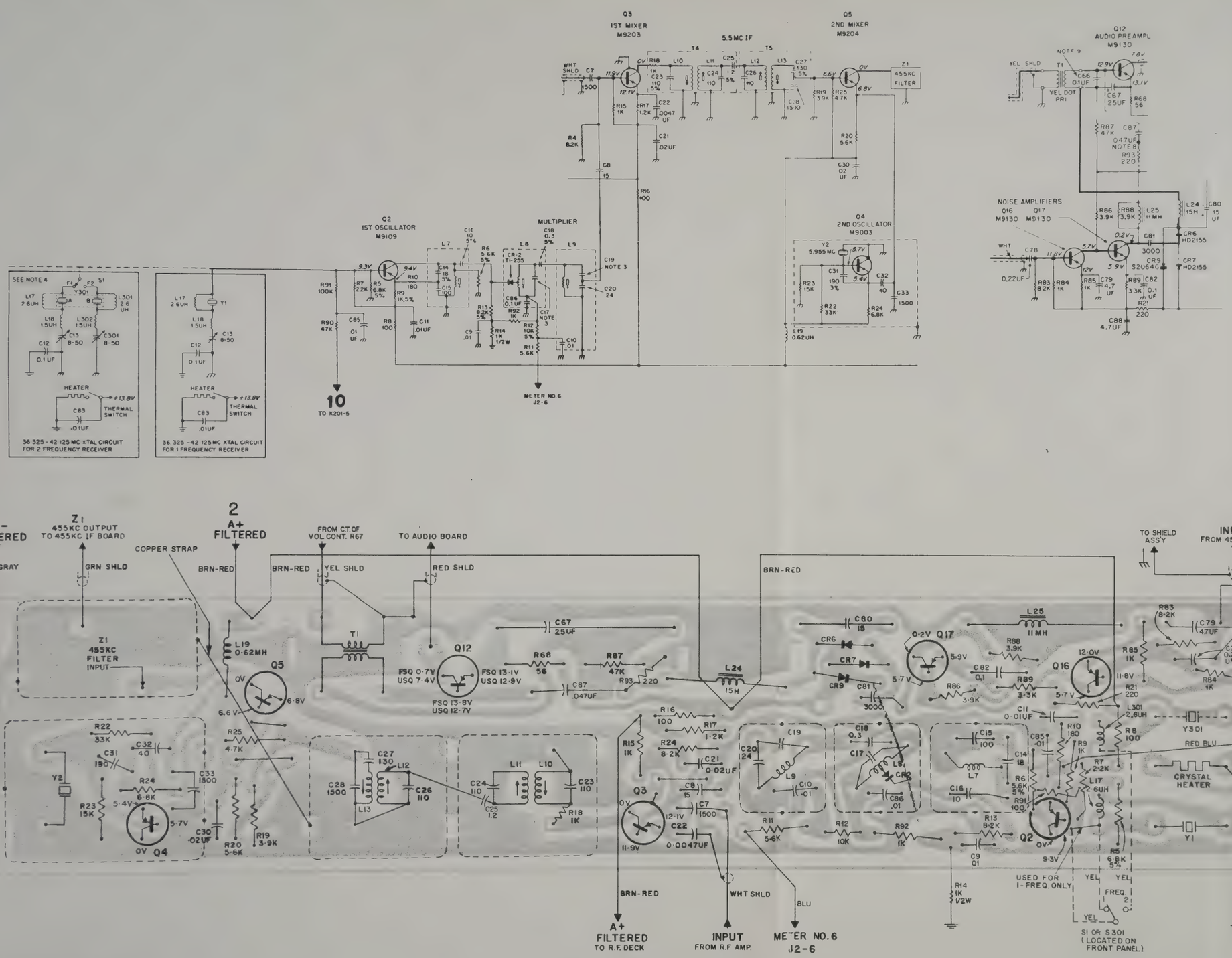




REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
B	TLD6371A	C17	ADDED 136-150.8 MC MODEL	PARTS LIST & SCHEM. DIAG.
C	TLD6371A-2 TLD6372B-3	Y2	WAS G04 5.955 MC	2ND OSCILLATOR
D	TLD6371A-3 TLD6372B-4	Y2	WAS G08, 5.04 MC	2ND OSCILLATOR

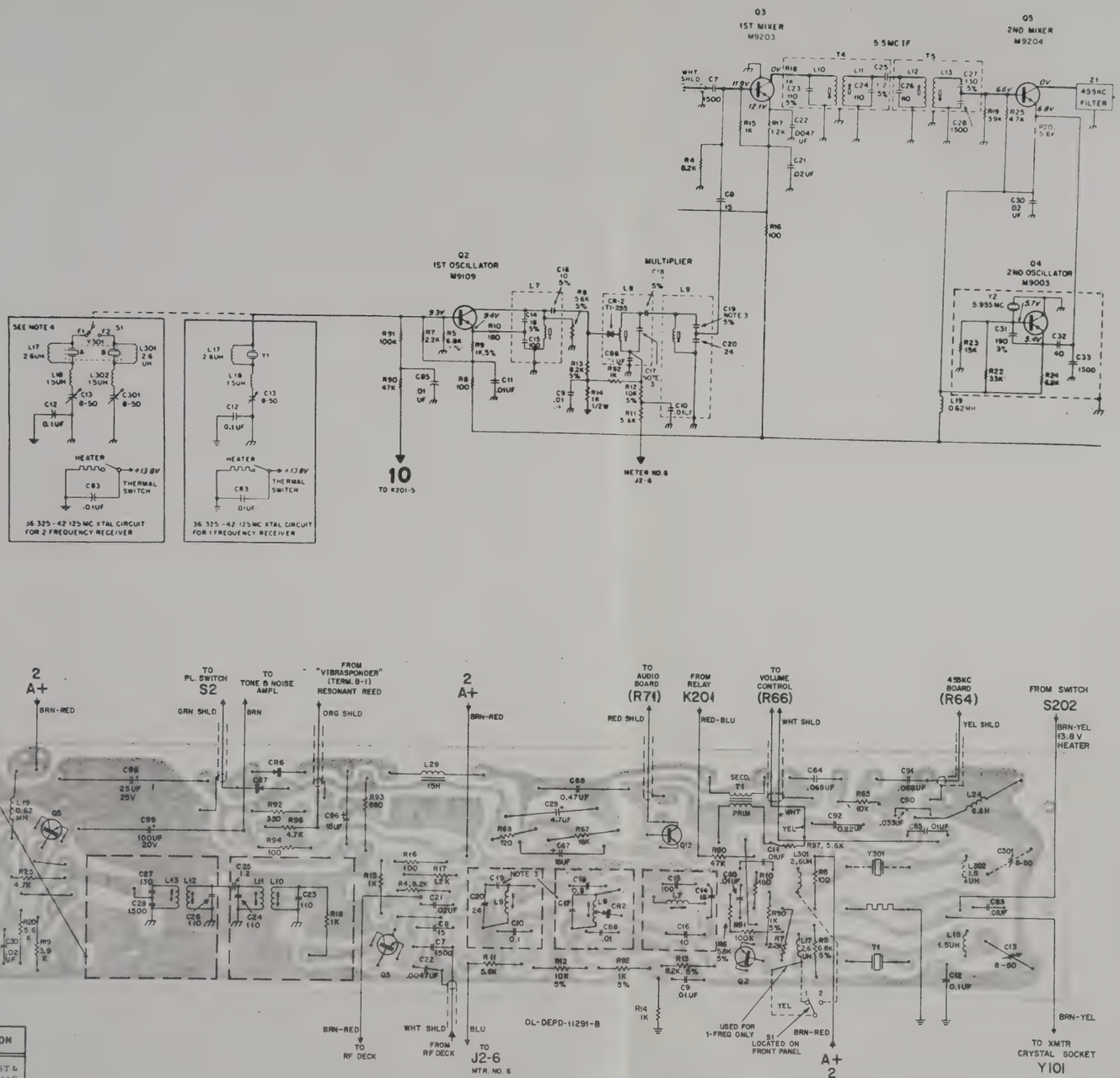
Dual Squelch Receiver
Models TLD6371A-3, TLD6372B-4 and TLD6362B
Front End Printed Board and Wiring Diagram
Motorola No. EPD-11292-D
5/2/67-GM

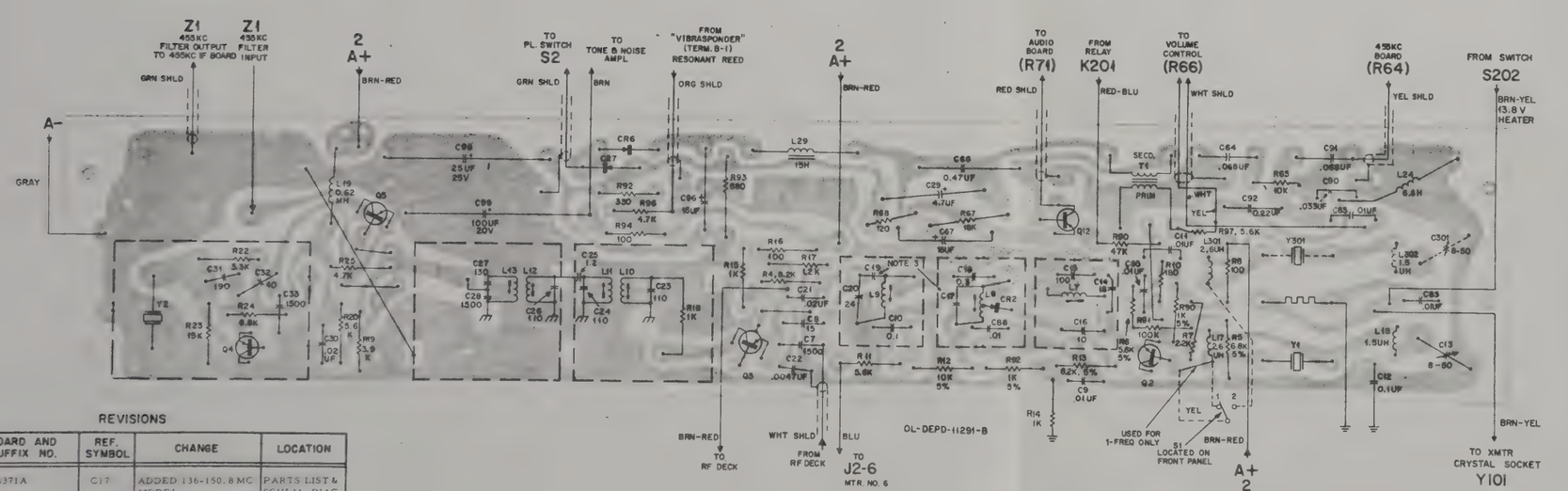


Carrier Squelch Receiver
("Quik-Call" Models Only)
Models TLD6571B & TLD6572B
Pre-Amplifier-Demodulator
Printed Board and Wiring Diagram
Motorola No. EPD-11289-A
2/24/67-GM

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TLD6571B-2 TLD6572B-2	Y2	WAS G04 5.955 MC	2ND OSCIL-LATOR



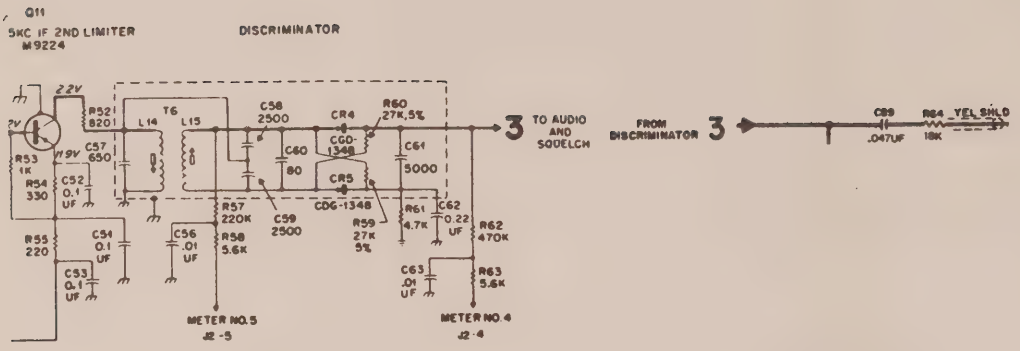


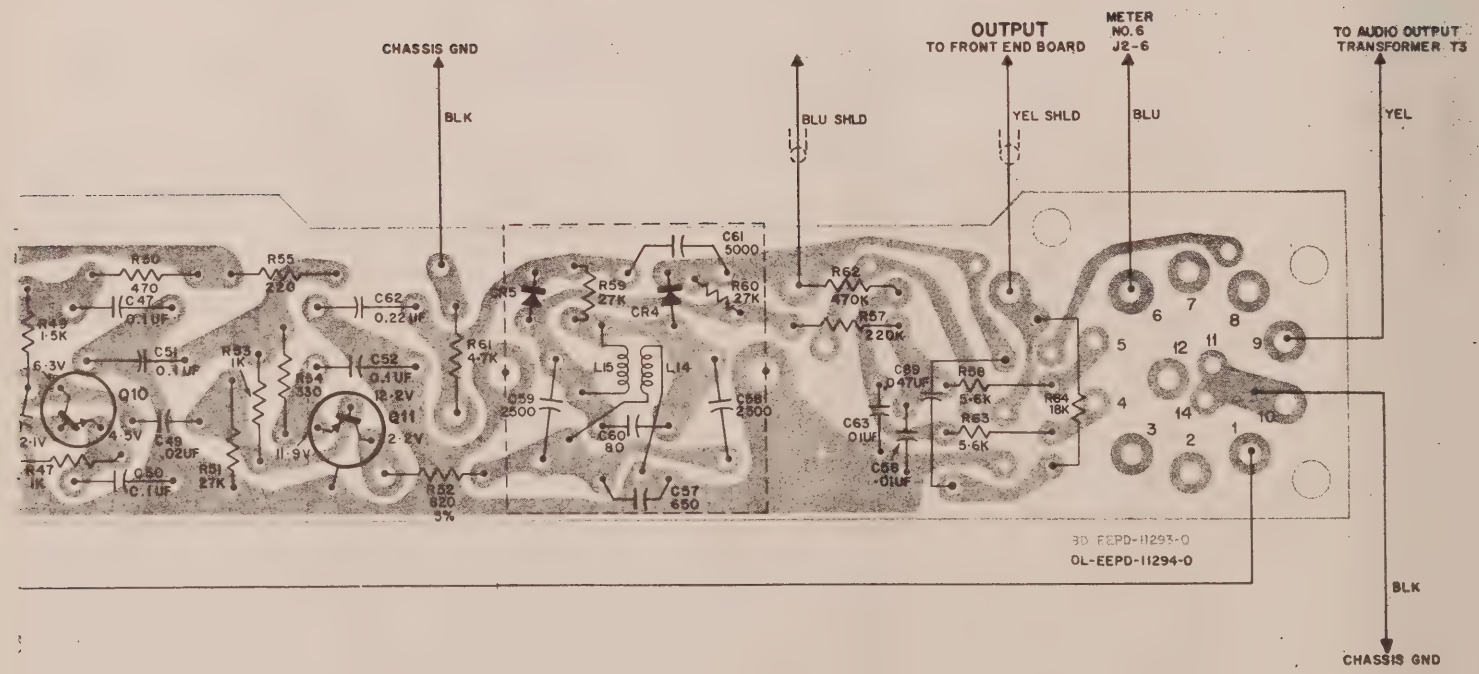
NOTE:
3 SEE PARTS LIST FOR COMPONENT VALUES.

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
B	TLD6371A	C17	ADDED 136-150.8 MC MODEL	PARTS LIST & SCHEM. DIAG.
C	TLD6371A-2 TLD6372B-3	Y2	WAS G04 5.955 MC	2ND OSCILLATOR
D	TLD6371A-3 TLD6372B-4	Y2	WAS G08, 5.04 MC	2ND OSCILLATOR

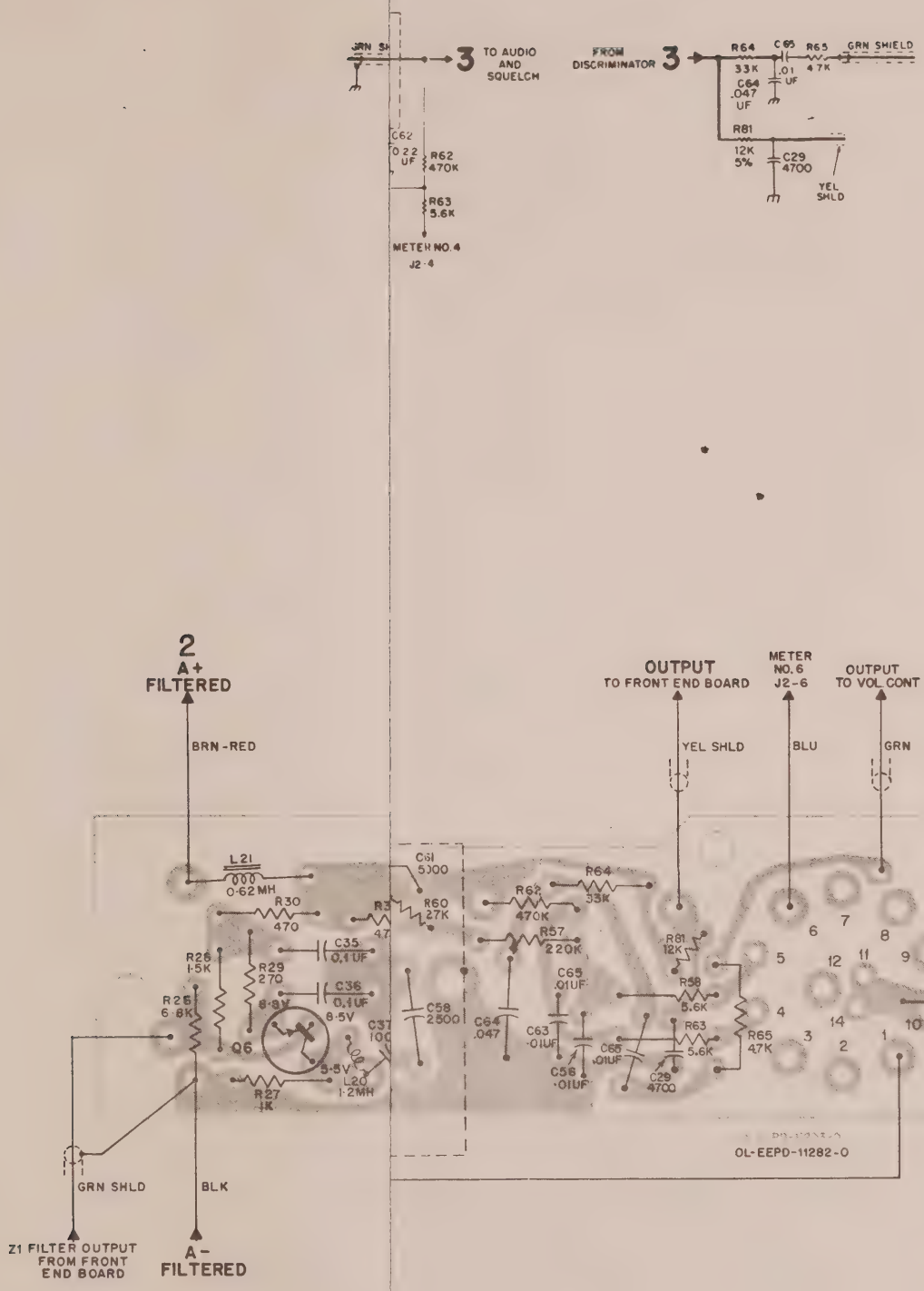
Dual Squelch Receiver
Models TLD6371A-3, TLD6372B-4 and TLD6362B
Front End Printed Board and Wiring Diagram
Motorola No. EPD-11292-D
5/2/67-GM



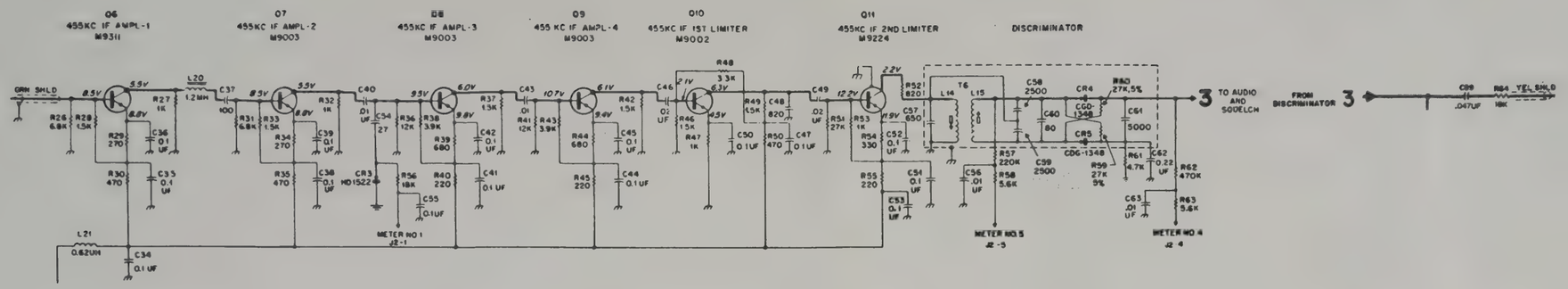


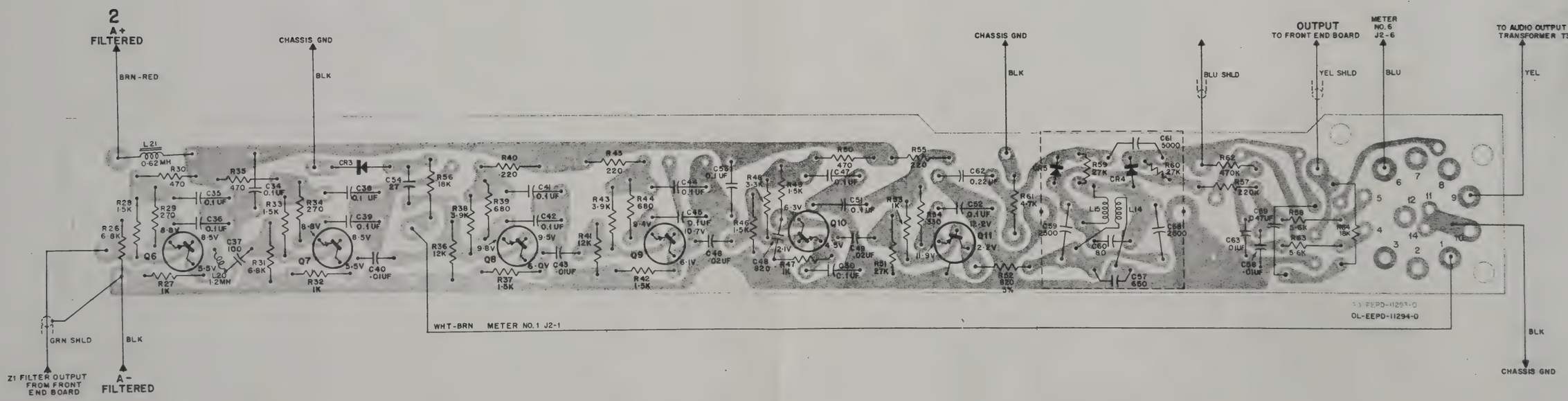
OCATION

RTIAL
IEMATIC
GRAM



Carrier Squelch Receiver
Model TLN6654B 455 KC IF
Printed Board and Wiring Diagram
Motorola No. EPD-11283-A
2/24/67-GM

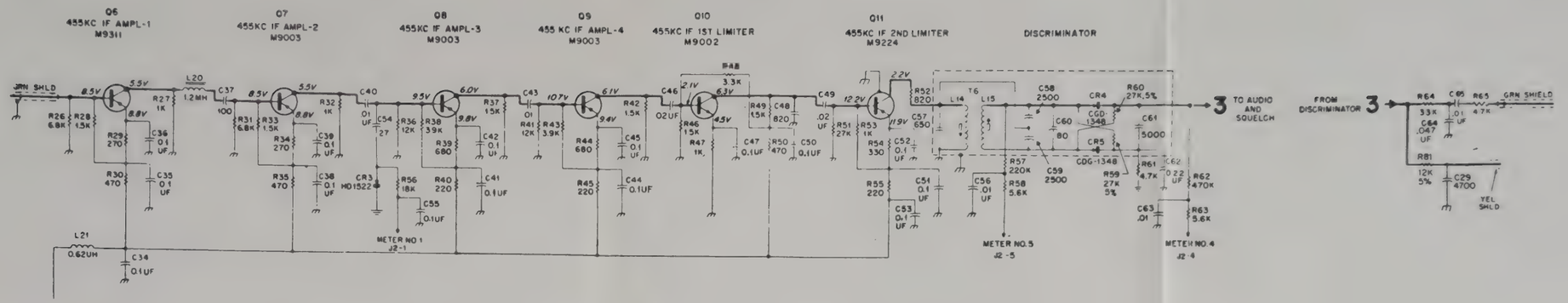


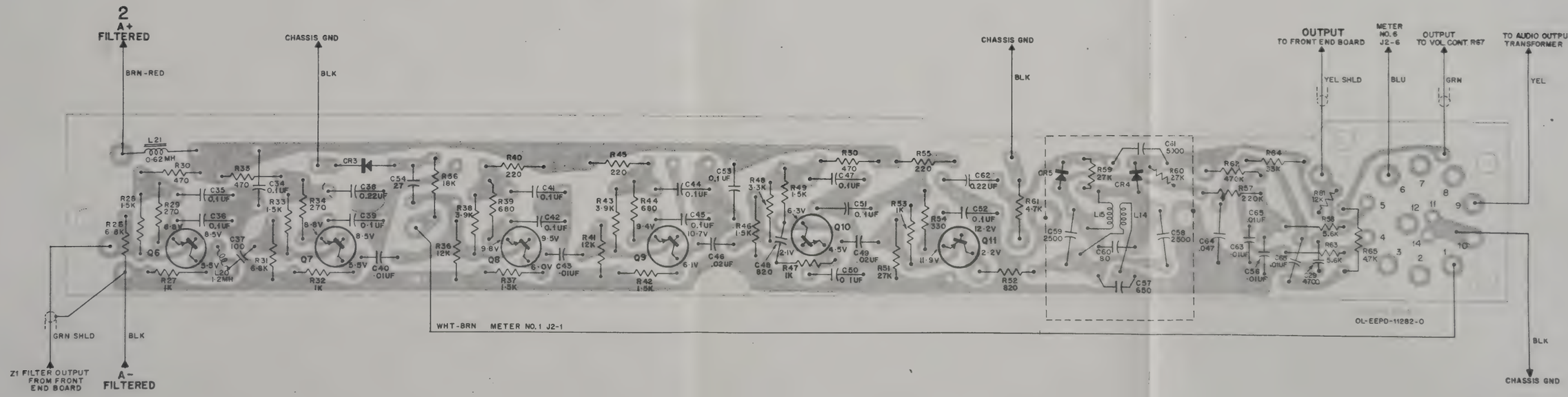


Dual Squelch Receiver
Model TLN6723B 455 KC IF
Printed Board and Wiring Diagram
Motorola No. EPD-11295-A
2/24/67-GM

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TLN6723B-1	Q6	WAS 48R869003, TYPE M9003	PARTIAL SCHEMATIC DIAGRAM





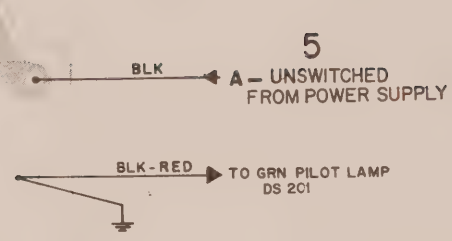
REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TLN6654B-1	Q6	WAS 48R869003, TYPE M9003	PARTIAL SCHEMATIC DIAGRAM

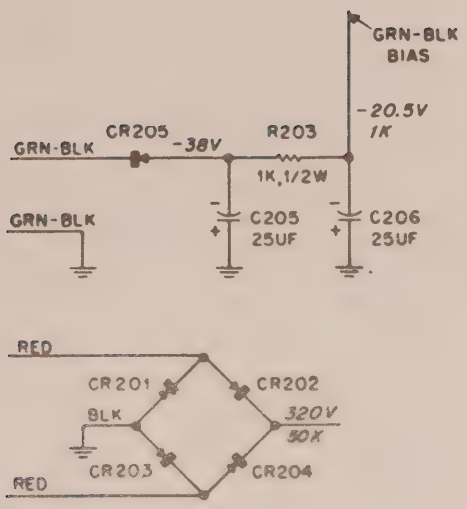
Carrier Squelch Receiver
Model TLN6654B 455 KC IF
Printed Board and Wiring Diagram
Motorola No. EPD-11283-A
2/24/67-GM

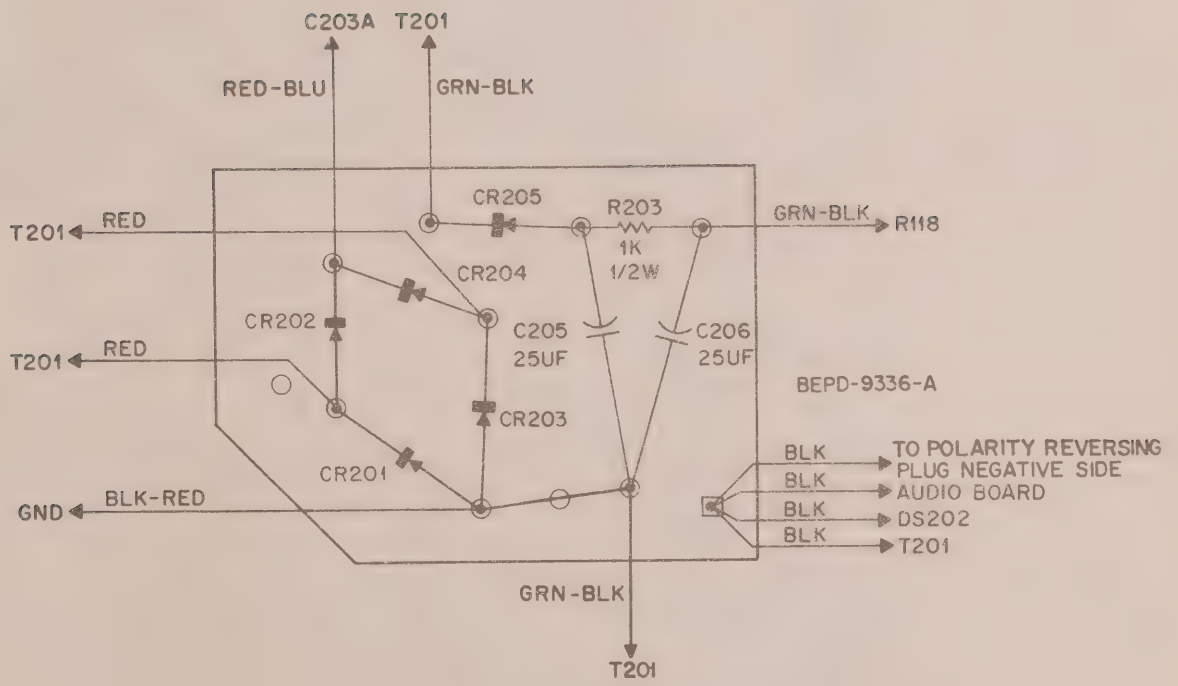
REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TUD1111BB-1 TUD1112BB-1 TUD1131BB-1 TUD1132BB-1 TUD1191BB-2 TUD1192BB-2 TUD1201AB-1 TUD1202AB-1 TUD1120BB-1 TUD1121BB-1	R98	ADDED 4.7K	T2 PRIMARY (PARTIAL SCHEMATIC ONLY)

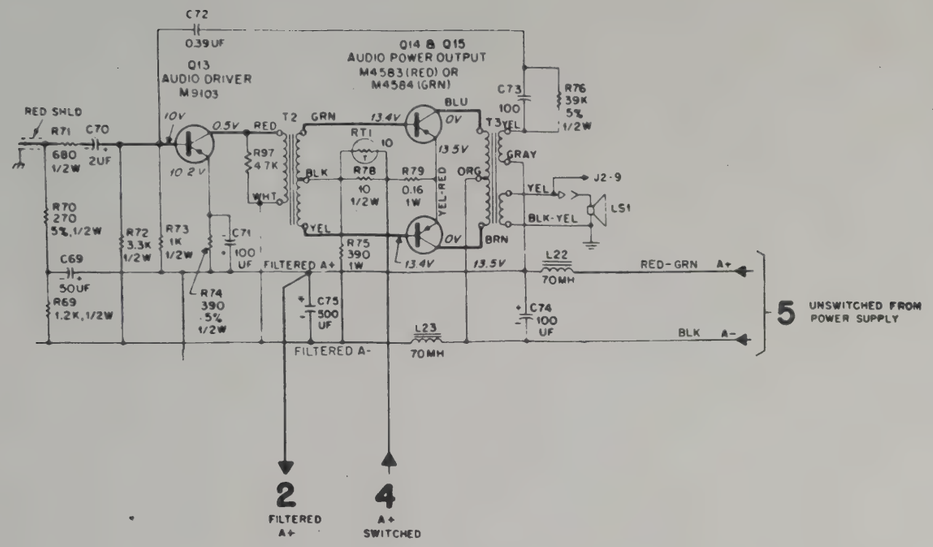


OL-EEPD-9339-A



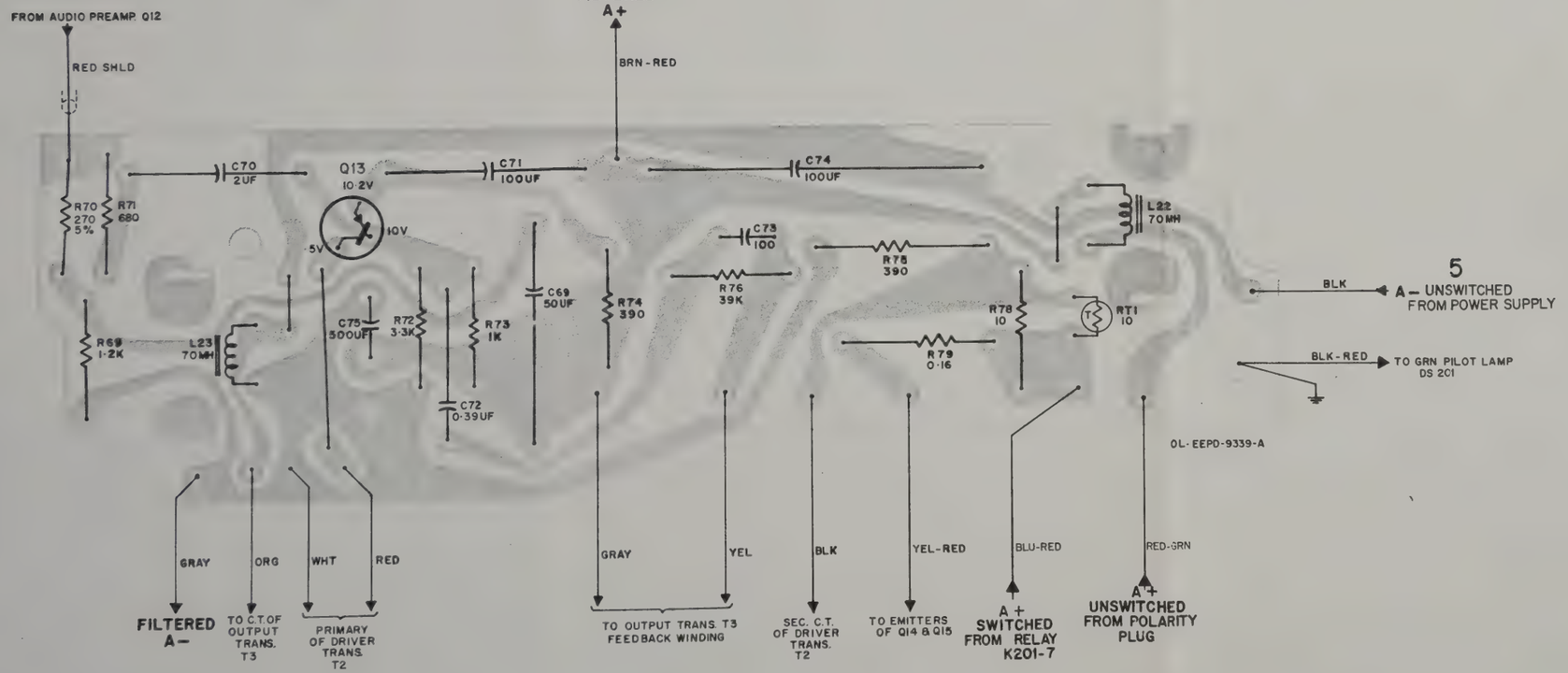


Model TLN6751A Rectifier Board
And Wiring Diagram
Motorola No. EPD-11309-O
2/24/67-GM

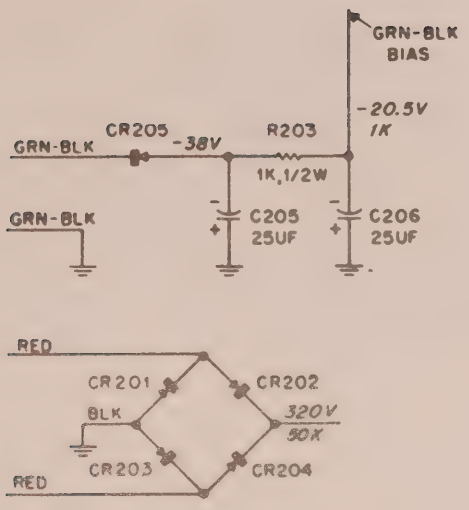


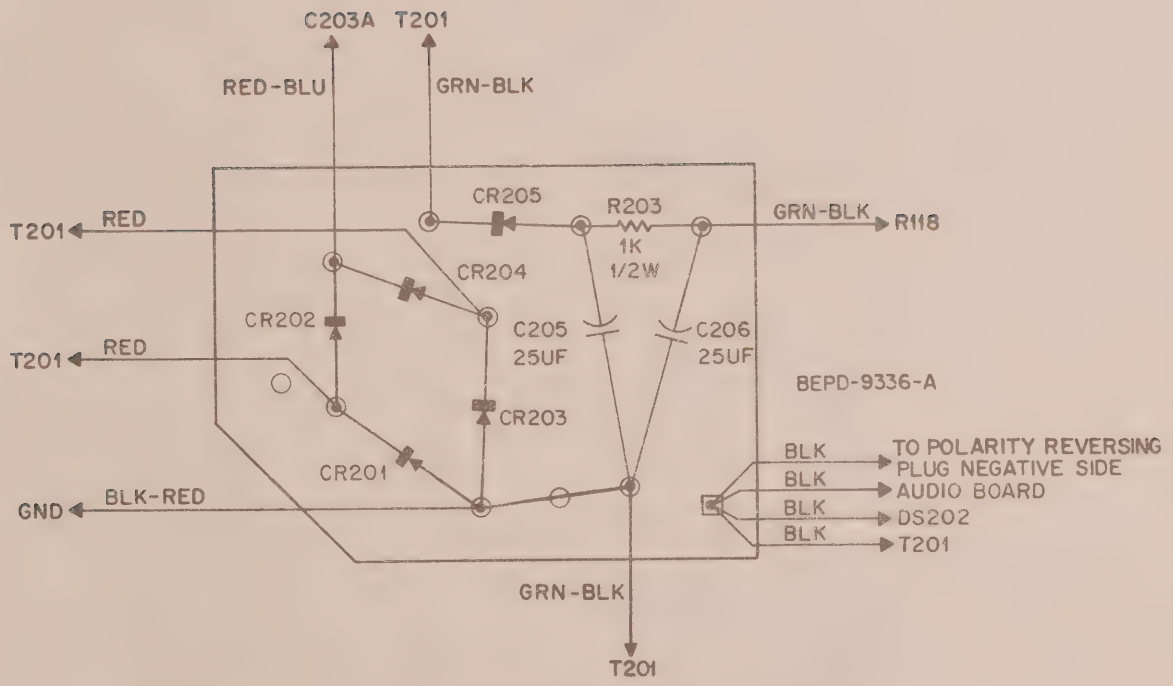
REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TUD1111BB-1 TUD1112BB-1 TUD1131BB-1 TUD1132BB-1 TUD1191BB-2 TUD1192BB-2 TUD1201AB-1 TUD1202AB-1 TUD1120BB-1 TUD1121BB-1	R98	ADDED 4.7K	T2 PRIMARY (PARTIAL SCHEMATIC ONLY)

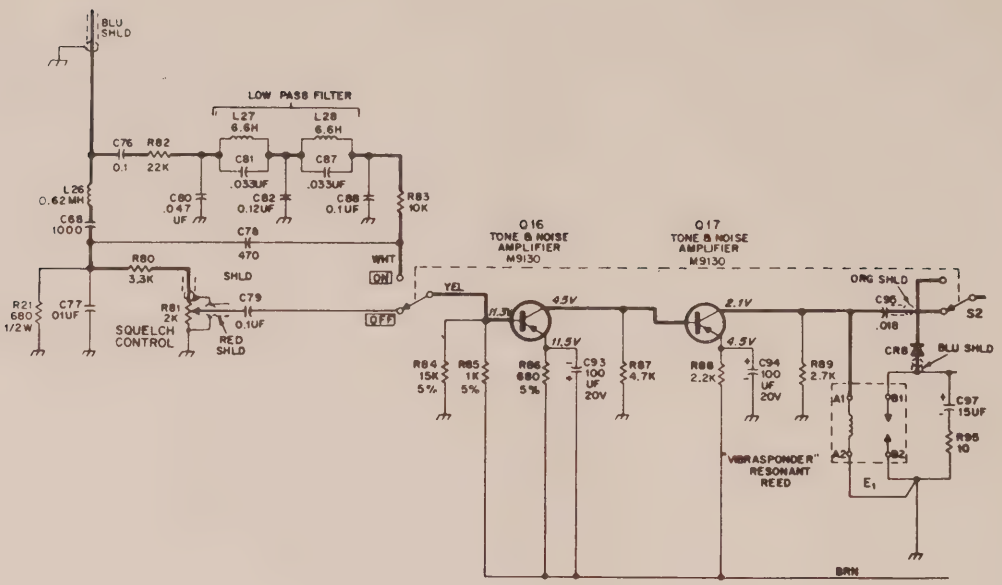


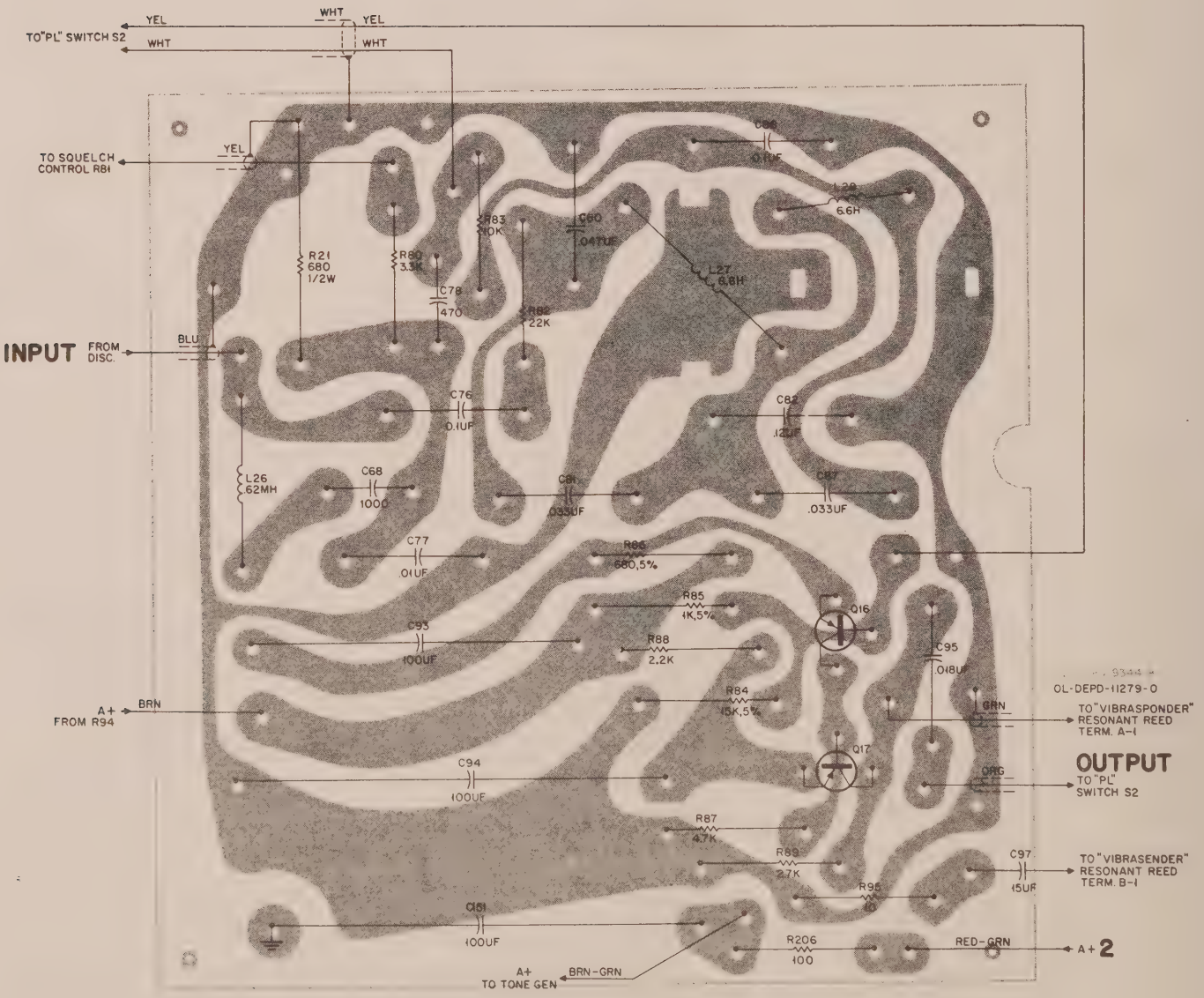
Model TLN6655A-2 Audio Output
Printed Board and Wiring Diagram
Motorola No. EPD-11308-A
2/24/67-GM



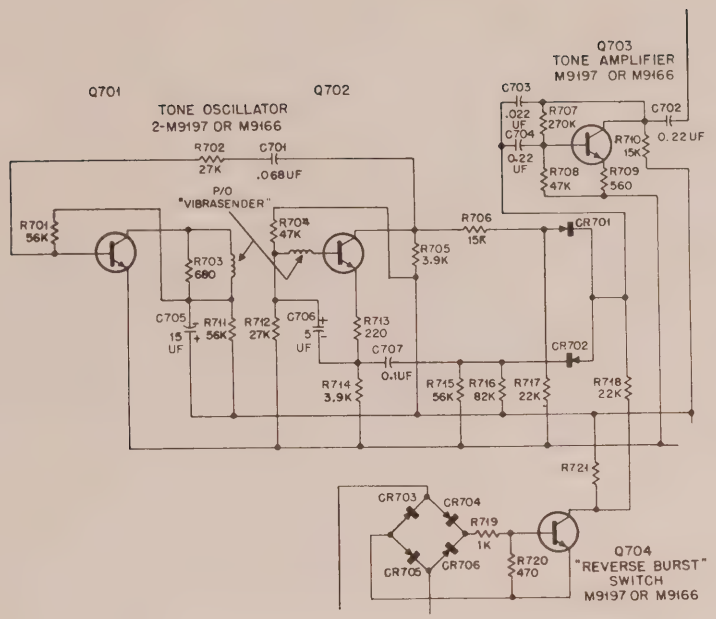


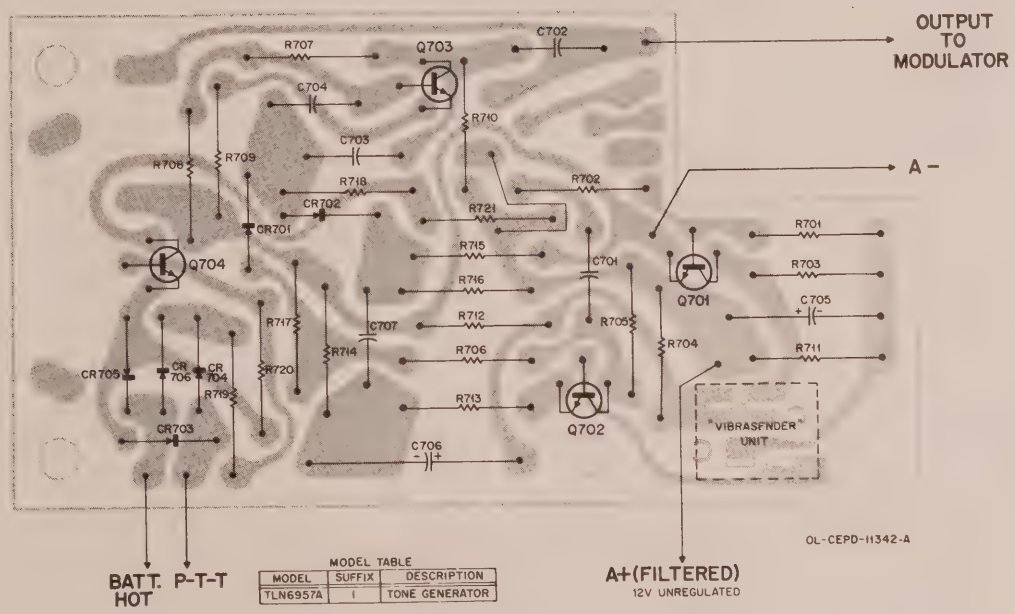
Model TLN6751A Rectifier Board
And Wiring Diagram
Motorola No. EPD-11309-O
2/24/67-GM





Dual Squelch Receiver
Model TLN6727B Tone & Noise Amplifier
Printed Board and Wiring Diagram
Motorola No. EPD-11280-O
2/24/67-GM

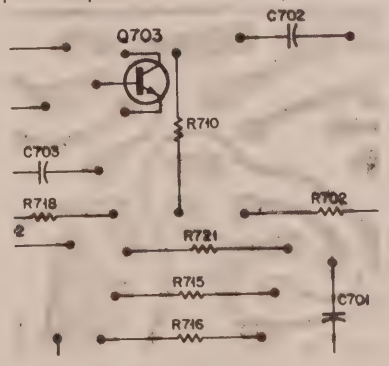




MODEL TABLE

MODEL	SUFFIX	DESCRIPTION
TLN6957A	1	TONE GENERATOR

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	TLN6957A-1		REVISED PRINTED CIRCUIT. CIRCUIT WAS AS SHOWN BELOW.	Q703 COLLECTOR
				
B	TLN6957A-1		"VIBRASENDER" WAS "VIBRASPONDER"	SCHEMATIC

"Private-Line" Transmitter
Model TLN6957A Tone Generator
Printed Board and Wiring Diagram
Motorola No. EPD-11343-B
2/24/67-GM

PRE-ALIGNMENT NOTES

FCC REGULATIONS STATE THAT

1. Radio transmitters may be tuned or adjusted only by persons holding a 1st or 2nd class radiotelephone operator's license or by personnel working directly under their immediate supervision.

2. The r-f power output of a mobile unit shall be no more than required for satisfactory technical operation as specified in the licensing of the transmitter, considering the area to be covered and the local conditions.

3. The frequency and deviation must be checked before a transmitter is placed in service and then re-checked once each year thereafter.

TEST EQUIPMENT REQUIRED

1. Motorola S1056A-9A or TU546 Series Portable Test Set with a Motorola Model TKN6025A Cable (available on separate order). A 0-50 microampere meter with 20,000 ohms series resistance may be used if a test set is not available.

2. Motorola TLN6383A Alignment Tool Kit (supplied with radio set).

3. Motorola T1130A Series Frequency Monitor or equivalent (for oscillator alignment and deviation adjustment).

4. Motorola T1013A RF Load Resistor, r-f wattmeter or dummy antenna.

HOW TO SET UP THE S1056A-9A OR TU546 SERIES TEST SET

1. Set the function selector switch to XMTR. position.

2. Place the oscillator and meter reversing switch in the OFF position.

3. Connect 20-pin meter cable plug to test set; connect the TKN6025A Adapter Cable to the cable coming from the test set; connect the other end of the adapter cable to the transmitter metering socket.

4. Connect the r-f wattmeter (or dummy load) to the ANTENNA receptacle.

5. Turn the equipment on and allow at least 45 seconds for warm-up.

HOW TO KEY THE TRANSMITTER

Key the transmitter with the test set XMTR ON switch, or key and modulate the transmitter with the radio set microphone. It is not possible to key and modulate the transmitter with a microphone plugged into the test set.

CAUTION

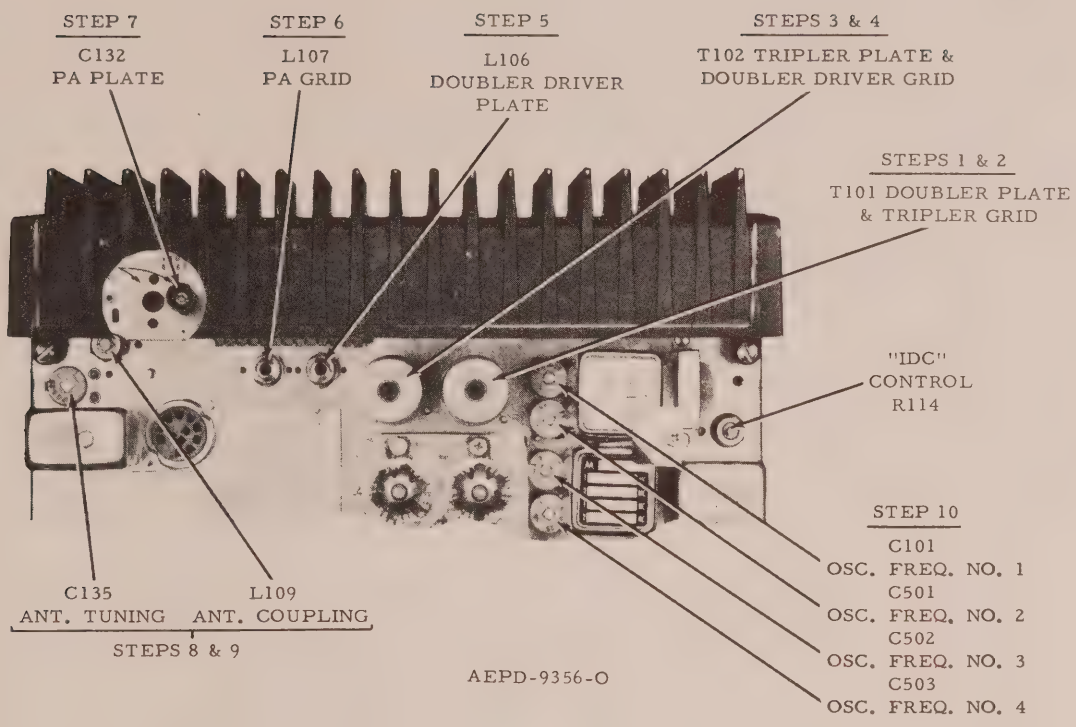
Do not key the transmitter for more than a few seconds at a time until it is properly tuned. Plate current is excessive in untuned stages and may damage the unit. Turn the transmitter on for brief periods while reading the meter and making the adjustments.

"IDC" ADJUSTMENT

For "IDC" ADJUSTMENT procedure (Transmitter Deviation) see the reverse side of this chart.

FREQUENCY CALCULATIONS

$f_0 = \frac{f_c}{12}$ where: f_0 = crystal frequency and f_c = carrier frequency



ADDITIONAL TEST EQUIPMENT REQUIRED FOR BENCH SET-UP

1. Motorola T1012A DC Power Supply with a Motorola TEK-15 Ripple Filter
2. Motorola TKN6100A Cable Kit (supplied with radio set)

MICROPHONE AND BATTERY TESTS

The test set can be used for testing the radio set microphone and the applied battery voltage, in the following manner:

1. Microphone Test
   - (a) Set up the test set as described in the pre-alignment notes.
   - (b) Place the test set selector switch to position 11.
   - (c) Hold the test set MULTIPLIER switch in its 0.2 v a-c position.
   - (d) Press the microphone push-to-talk switch and apply a loud sustained whistle of approximately 1000 cycles to the microphone.
   - (e) A meter indication of 0.12 volt to 0.23 volt should be obtained for a microphone that is functioning properly.

2. Battery Voltage Tests
   - (a) Set up the test set as described in the pre-alignment notes.
   - (b) Place the test set selector switch to position 10.
   - (c) The battery input voltage can be read on the meter only during standby periods.

CAUTION
DO NOT ATTEMPT TO TUNE
TRANSMITTER WITHOUT A LOAD

STEP	TEST SET SWITCH POSITION	ADJUSTMENT	METER READING	CIRCUIT METERED	STAGE, CONDITIONS AND PROCEDURE
1	4	T101 Top Slug	Max	Tripler Grid	DOUBLER PLATE Adjust T101 primary slug (from top) for maximum meter reading. NOTE On multiple frequency radios, place the frequency selector switch in the highest or most used frequency position for the following alignment procedures.
2	4	T101 Bottom Slug	Max	Tripler Grid	TRIPLER GRID Adjust T101 secondary slug (from bottom) for maximum meter reading.
3	5	T102 Top Slug	Max	Doubler Driver Grid	TRIPLER PLATE Adjust T102 primary slug (from top) for maximum meter reading.
4	5	T102 Bottom Slug	Max	Doubler Driver Grid	DOUBLER DRIVER GRID Adjust T102 secondary slug (from bottom) for maximum meter reading.
5	6	L106 (Primary)	Max	PA Grid	DOUBLER DRIVER PLATE Adjust L106 (primary slug) for maximum meter reading.
6	6	L107 (Secondary)	Max	PA Grid	PA GRID Adjust L107 (secondary slug) for maximum meter reading
7	7 (PA)	C132	Min (Dip)	PA Plate	PA PLATE Turn L109, antenna coupling adjustment, fully counter-clockwise (decoupled). Adjust C132, PA plate tuning capacitor, for minimum meter reading. Set C135, antenna tuning capacitor, for minimum PA plate current.
8	7 (PA)	L109 and C135	Max (110 ma limit)	PA Plate	PLATE LOADING Turn L109, antenna coupling adjustment, clockwise to increase PA plate current to 75-80 ma (reading of 15-16 on portable test set meter). Tune C135, antenna tuning capacitor, for a peak meter reading. Then re-adjust L109 for the rated load current of 110 ma (reading of 22 on portable test set meter). XMTR ON switch on test set must be pressed to get a reading in this position.
9	7 (PA)	L109 and C135	Max r-f output CAUTION DO NOT EXCEED 110 ma PA plate current	PA Plate	ANTENNA COUPLING Remove test load and connect antenna. a. Using Field Strength Meter Place r-f probe near antenna. Adjust C135, antenna tuning capacitor, and L109, antenna coupling, for maximum reading on field strength meter. Do not exceed 110 ma PA plate current (reading of 22 on portable test set meter). Reduce antenna coupling if necessary to keep PA plate current below 110 ma. b. Without Field Strength Meter Turn L109, antenna coupling, clockwise to increase PA plate current to 75-80 ma (reading of 15-16 on portable test set meter). Tune C135, antenna tuning capacitor, for a peak meter reading. Then re-adjust L109 for the rated load current. Do not overcouple. This will only reduce power output. Do not exceed 110 ma PA plate current (reading of 22 on portable test set). Reduce antenna coupling if necessary to keep PA plate current below 110 ma.
10	---	C101 C101 & C501 (2-freq. models) C101, C501, C502 & C503 (4-freq. models)	---	---	OSCILLATOR FCC requlations require a periodic frequency check. If the check is due at this time follow procedure at the right hand side of this chart; otherwise NO ADJUSTMENT SHOULD BE MADE.

OSCILLATOR FREQUENCY ADJUSTMENT

Setting the oscillator "on frequency" is the only oscillator adjustment necessary and should be done after the transmitter has been aligned. To make this adjustment perform the following:

Turn the radio set on and allow a five minute warm-up period.

Set up the frequency monitor as described in the frequency monitor instruction manual. Place the monitor antenna within a few feet of the transmitter.

Plug the selected channel crystal into the socket and set MON CHANNEL SELECTOR to corresponding position. Follow standard monitoring procedure.

Adjust C101 for a zero reading on the monitor CARRIER FREQUENCY meter (if transmitter is a multiple frequency unit, place the frequency selector switch in the F1 position). On multiple frequency units repeat this operation for the remaining frequency adjust capacitors and corresponding frequency selector switch positions.

After setting the transmitter "on frequency" remove the transmitter control crystal. The wattmeter must drop to zero. Replace crystal.

FINAL METER READINGS

1. Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook.

2. All readings given in the table below (based on nominal battery voltage) are minimum except PA (position 7), which is maximum. DO NOT exceed the value given for the PA current. This is the maximum plate current to which the unit can be safely tuned.

3. Readings 4 through 6 are purely relative and do not give actual current or voltage measurement.

4. The S1056A-9A or TU546 series test sets have a 0-1000 volt d-c scale from which the B+ is read directly in position 9.

5. Multiply the scale reading on meter position 7 by 5 to obtain the actual PA plate current in milliamperes.

TRANSMITTER METERING TABLE

S1056A-9A or TU546 SERIES SWITCH POSITION	1	2	3	4	5	6	7 PA	9 B+
METER READING	-	-	-	10 (min)	10 (min)	20 (min)	22 (max)	300 v d-c (nominal)
CIRCUIT METERED	-	-	-	Tripler Grid	Doubler Grid	PA Grid	PA Plate	B+

"IDC" ADJUSTMENT (PREFERRED METHOD USING OSCILLOSCOPE)

1. INTRODUCTION

Accuracy of test equipment is of prime importance to any user of radio communications equipment; but of equal importance is a knowledge of the characteristics of the measuring equipment under various conditions. The Motorola T1130A Series FM Station Monitor is the leader in the field with respect to sensitivity, accuracy under conditions of variation in r-f signal level, line voltage and other environmental conditions. In common with most other meters, however, it has the characteristic of responding differently to different wave shapes. Therefore, the use of most present-day deviation meters can lead to confusion and errors in deviation setting, if the pitfalls are unknown or disregarded.

The "ideal" deviation indicator would be one which would respond instantaneously to the peak value of the modulation deviation, regardless of waveform. The only device which meets all these requirements is an oscilloscope. It responds instantaneously, and it shows the peak value of any waveform, no matter how complex. Properly calibrated, there is no more accurate or reliable means for measuring and setting transmitter deviation.

The oscilloscope must be used in conjunction with a receiver which has a stable discriminator characteristic, since the oscilloscope displays the demodulated signal. In addition to the oscilloscope, we need a receiver and a means to accurately calibrate the system. The Motorola Monitor fills these requirements, since it provides both a sensitive receiver with the proper discriminator characteristic, and a reliable means of calibrating the oscilloscope. It even has convenient terminals on the front panel for connection of the oscilloscope. Furthermore, the Motorola T1130A Series FM Station Monitors are provided with two modulation meter scales, 0-20 kc for wide-band systems, and 0-10 kc for split-channel systems.

Split-channel conversion kits are available for modification of older monitors, so that they too are provided with convenient oscilloscope terminals and can be more accurate measurement devices for such systems.

2. TEST EQUIPMENT REQUIRED

a. Motorola Model T1130A Series FM Station Monitor (or equivalent)

b. Motorola Transistorized AC Voltmeter (or equivalent)

c. Motorola Model TEK-1A Transistorized Tone Generator, 1000 cps (or equivalent audio oscillator)

d. Motorola Model S1056A-9A or TU546 Series Portable Test Set with Motorola Model TKN6025A Cable (available on separate order)

e. Motorola Model T1015A General Purpose or T1014B Precision Wide Band Oscilloscope (or equivalent)

f. Motorola T1013A RF Load Resistor, r-f wattmeter or dummy antenna

g. Motorola T1012A DC Power Supply with a Motorola TEK-15 Ripple Filter

h. Motorola TKN6100A Cable Kit (supplied with radio set)

3. OSCILLOSCOPE CALIBRATION

The first step in measurement of transmitter deviation is to calibrate the oscilloscope. This can be done by using the transmitter which is to be measured. A "Private-Line" unit can be used for this purpose if the tone oscillator is disabled by removal of the "Vibrasender" resonant reed. This is necessary since the "Private-Line" tone contributes to the maximum deviation.

To perform IDC ("Instantaneous Deviation Control") adjustment proceed as follows:

a. Connect the r-f wattmeter (or dummy load) to the ANTENNA receptacle.

b. The oscilloscope should be connected to the monitor oscilloscope terminals and the monitor controls should be set up in accordance with the instruction manual.

c. Turn the IDC control to the full clockwise position.

d. Use the TKN6025A Adapter Cable and connect the S1056A-9A or TU546 Portable Test Set to the transmitter metering receptacle. Apply a 1000 cps test tone to the termination point of the BLACK (high audio) and RED (low audio) leads on the radio set microphone cable. An audio oscillator must be used for generation of this tone, since sinusoidal waveform is very important for this calibration. The Motorola TEK-1A Transistorized Tone Generator is excellent for this purpose.

NOTE

When keying the transmitter, use the test set XMTR on switch or the radio set microphone. Do not key transmitter with a microphone plugged into test set.

Modulate the transmitter with this tone so adjusted that the deviation as read on the FM monitor deviation meter, is 2 kc (6 kc in a wide-band system).

e. Adjust the vertical gain of the oscilloscope so that the total recovered audio pattern occupies some convenient height, e.g., four small squares (12 squares in a wide-band system). The split-channel case is shown in figure 1.

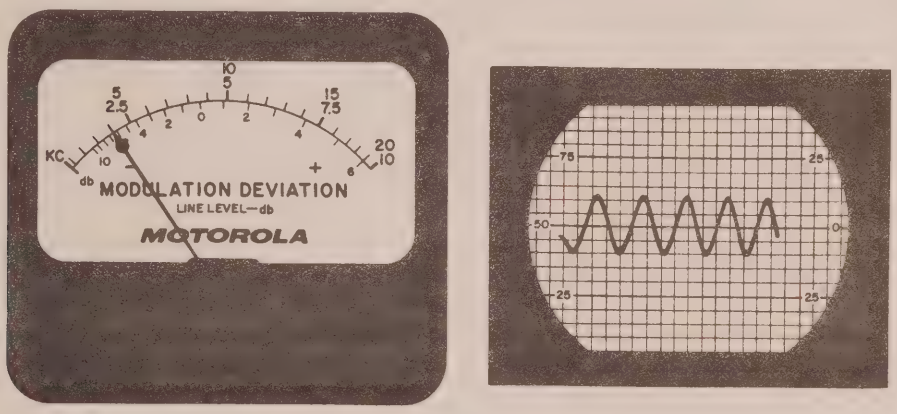


Figure 1.
Oscilloscope Calibration for
Split-Channel Condition

Having calibrated the oscilloscope, there is no further need for the modulation deviation meter and its reading should be ignored from this point on. It has already performed its important function of calibrating our oscilloscope.

With the oscilloscope calibrated as indicated, a recovered signal which occupies 10 squares (peak-to-peak) is equivalent to ±5 kc deviation. For wide-band systems, a recovered signal occupying 30 squares (peak-to-peak) is equivalent to ±15 kc deviation.

4. MEASUREMENT AND SETTING OF TRANSMITTER DEVIATION

Once the oscilloscope has been calibrated, the transmitter deviation can be properly adjusted by the following applicable method.

a. For Transmitters in Standard Noise Squelch Systems

(1) Adjust the 1000 cps input signal to 1 volt. This should drive the IDC circuit to the full clip. See figure 2.

(2) With this input signal level, adjust the IDC control on the transmitter to provide a 10-square peak-to-peak recovered signal on the oscilloscope. This is equivalent to ±5 kc deviation as shown in figure 2. A wide-band system should be adjusted for 30 squares (±15 kc).

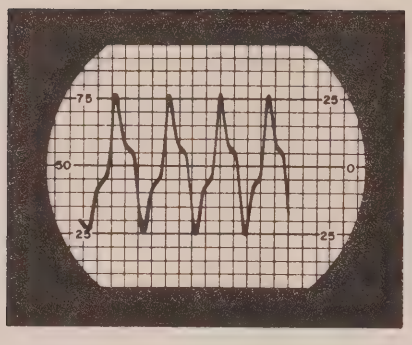


Figure 2.
5 KC Peak Deviation as seen on the Oscilloscope
(NOTE: Waveform is clipped fully)

(3) Reduce 1000 cps input to 0.25 volt. Essentially full deviation should still be observed on the oscilloscope. Less than full deviation may indicate a weak audio tube or other lack of audio gain.

b. For Transmitters in "Private-Line" Systems

(1) Check the "Private-Line" tone deviation. This may be read directly from the oscilloscope by pressing the transmitter "push-to-talk" switch on the test set. The tone deviation should be 0.5 to 1 kc for split-channel units and 1 to 2 kc for wide-band units.

NOTE

Due to a slight increase in discriminator response at the lower frequencies, the oscilloscope will read high, thus, an indication of 1.4 to 2.8 squares (peak-to-peak) is equivalent to 0.5 to 1 kc for split-channel unit. For wide-band units, the indication will be proportionately higher. This slight variation is only important when checking tone deviation. When setting maximum transmitter deviation as described below, it may be ignored.

(2) Adjust the 1000 cps input signal level for 1 volt and note the resultant combined deviation of the 1000 cps modulation and tone signal modulation on the oscilloscope.

(3) The IDC control on the transmitter should be adjusted to provide peak-to-peak combined signal of 10 squares, equivalent to full 5 kc as shown in figure 3. Wide band units should be adjusted for 30 squares peak-to-peak (±15 kc).

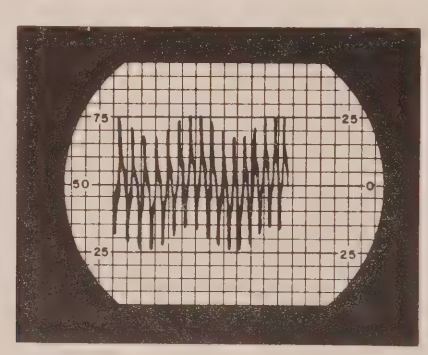


Figure 3.
5 KC Peak Deviation for Combined PL Tone and 1000 CPS Modulation
(NOTE: PL Tone Superimposed on 1000 CPS Tone)

(4) Reduce the 1000 cps input to 0.25 volt. Essentially full combined 1000 cps tone and "Private-Line" tone deviation should still be observed on the oscilloscope. Less than full combined deviation may indicate a weak audio tube or other lack of audio gain.

5. EMERGENCY MEASUREMENT OF DEVIATION

In the absence of an audio oscillator, a loud sustained whistle of approximately 1000 cps can be used for a rough measurement of deviation. If this rough check indicates the need for resetting deviation, do so only under controlled conditions, using a 1000 cps tone as previously indicated. The calibration of the oscilloscope should always be performed with a steady controlled signal. Do not attempt to calibrate the oscilloscope with a sustained whistle, as waveform distortion will prevent an accurate calibration.

6. OTHER MEANS FOR MEASUREMENT OF DEVIATION

Another accurate means of measuring transmitter deviation is to use the Motorola T1021A Portable Frequency Meter or the Motorola S1058A or S1059A Portable Test Sets. These units, properly used, permit the accurate measurement and setting of transmitter deviation from a peak reading meter, which is unaffected by waveform. An oscilloscope is not required with these instruments. Transmitter deviation can be measured accurately even with voice modulation.

7. MICROPHONE LEVEL

If the modulation level in the system still appears to be too low after setting deviation as above, check the microphone.

The foregoing procedure will insure that the transmitter will comply with FCC requirements for maximum deviation.

The importance of the correct deviation setting cannot be overemphasized. Optimum system performance demands accurate deviation setting, both from the standpoint that overdeviation will interfere with the user on the adjacent channel and underdeviation may reduce system range.

TEST EQUIPMENT REQUIRED

1. Motorola Model S1056A-9A or TU546 Series Portable Test Set with Motorola Model TKN6025A Adapter Cable (available on separate order).
2. Motorola Transistorized AC Voltmeter or equivalent.
3. Motorola Model T1034C FM Signal Generator or equivalent.
4. Motorola TLN6658A Alignment Tool Kit (supplied with radio set).

ADDITIONAL TEST EQUIPMENT REQUIRED FOR BENCH SET-UP

1. Motorola T1012A DC Power Supply with a Motorola TEK-15 Ripple Filter.
2. Motorola TKN6100A Input Power Cable Kit (supplied with radio set).

HOW TO SET UP THE S1056A-9A OR TU546 SERIES TEST SETS FOR 455 KC ALIGNMENT

1. Set the function selector switch to the RCVR position.
2. Connect the 20-pin plug end of the metering cable into the receptacle on the test set. Connect the TKN6025A Adapter Cable to the other end of the metering cable. Plug the adapter cable into the metering socket on the receiver. The 20-pin metering cable plug acts as the internal battery ON-OFF switch. Pins 19 and 20 on the plug are jumpered. Connecting the plug to the test set socket completes the battery circuit. To conserve battery life when not using the test set either (1) disconnect meter cable from test set, or (2) set the Oscillator and Meter Reversing Switch to OFF and put Position Selector Switch to any position except 11 or 13.
3. Connect one end of the test set r-f extension cable to the r-f connector on the test set. Connect the other end of the extension cable to the r-f probe cable.
4. Place the oscillator and meter reversing switch to the 455 kc position.

TEST SET SELECTOR SWITCH POSITIONS

S1056A-9A or TU546 Series Test Sets	1	4	5	6
Circuit Metered	Base of 3rd 455 KC IF Amplifier	Discr. Output	2nd 455 KC Limiter	Oscillator

FREQUENCY CALCULATIONS

LEGEND

f_c = Carrier Frequency (136-174 mc)

f_0 = Oscillator Crystal Frequency (36.325-42.125 mc)

1st i-f = 1st IF Frequency (5.5 mc)

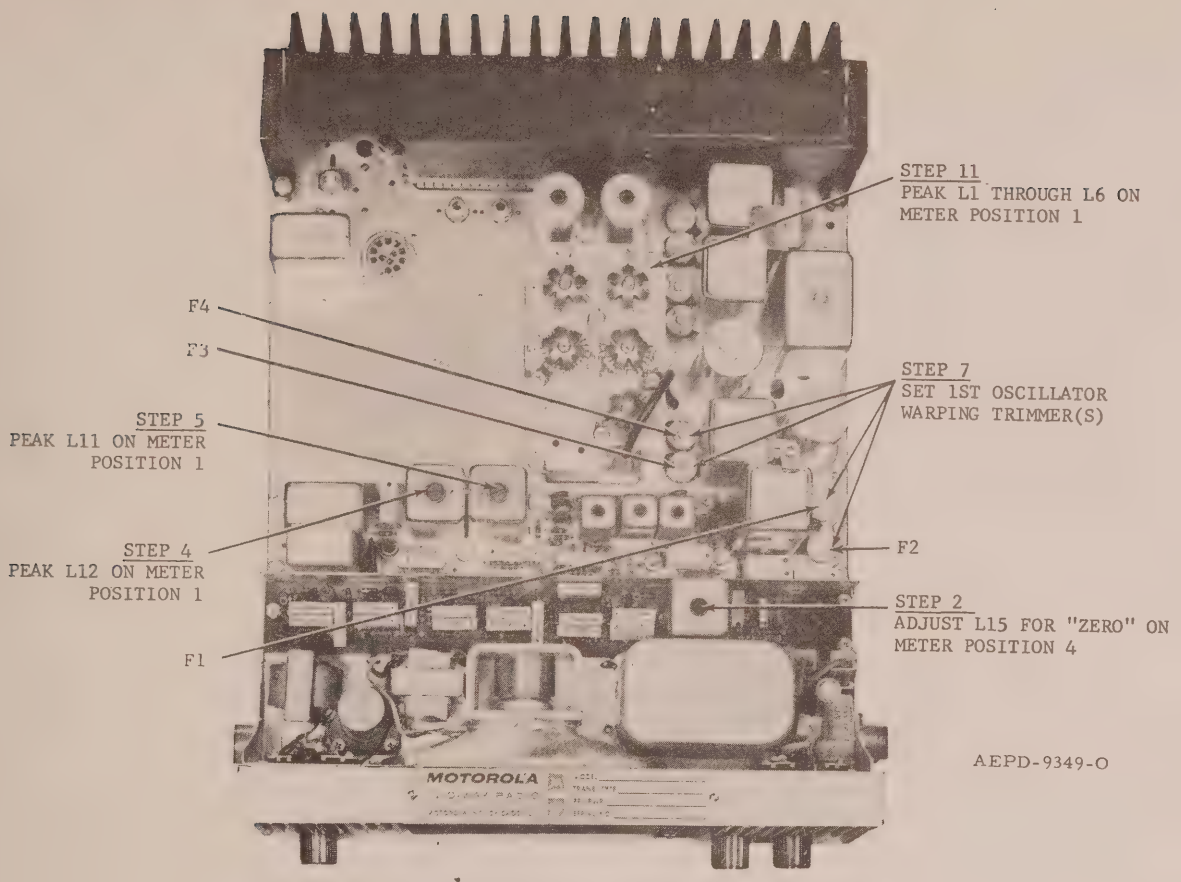
f_m = Multiplier Frequency = $f_0 \times 4$ = (145.3 mc-168.5 mc)

1. For the 135-150.8 mc range;

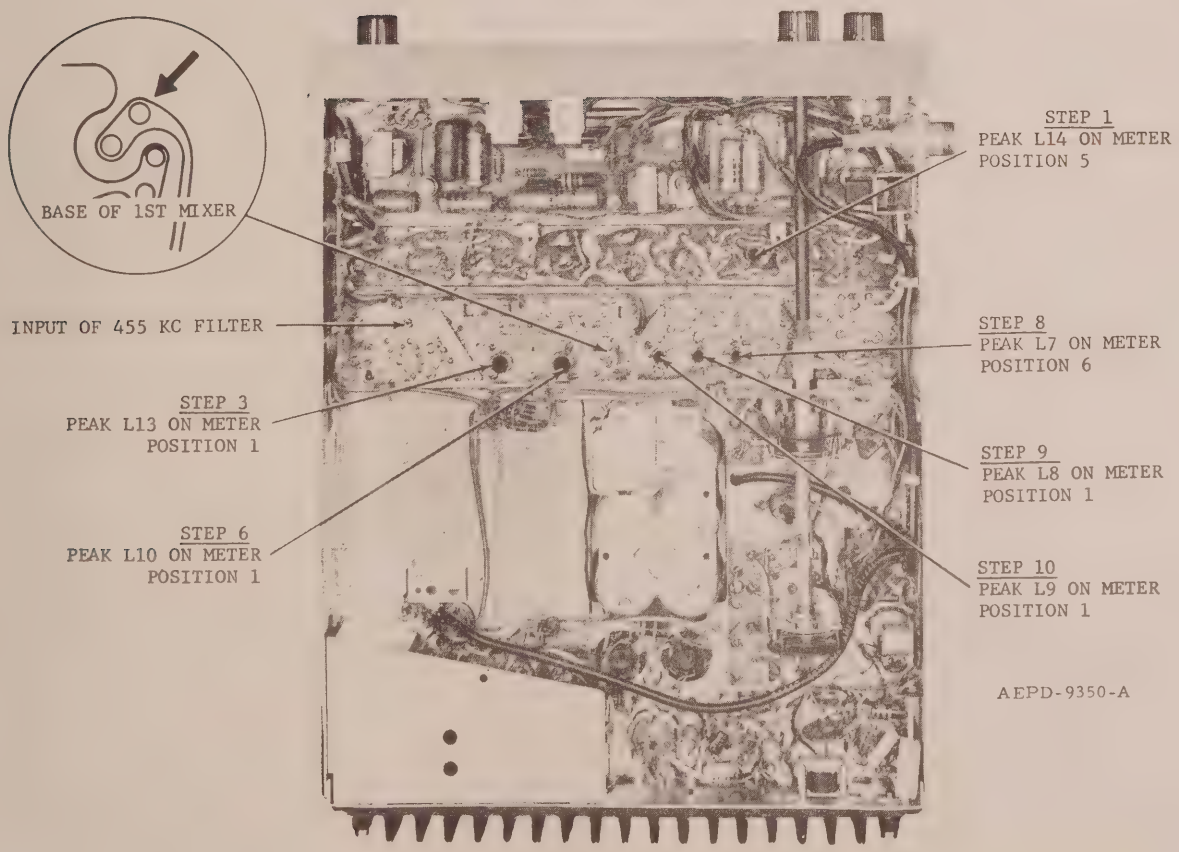
$$f_o = \frac{f_c + 5.5 \text{ mc}}{4} \qquad f_c = (f_o \times 4) - 5.5 \text{ mc}$$

2. For the 150.8-174 mc range;

$$f_o = \frac{f_c - 5.5 \text{ mc}}{4} \qquad f_c = (f_o \times 4) + 5.5 \text{ mc}$$



Top View



Bottom View

RECEIVER ALIGNMENT PROCEDURE

NOTE

To insure proper alignment, coils L1 through L15 must be detuned, by backing the tuning slugs and trimmers out fully counterclockwise. Coils L7, L8, L9, L10 and L13 are tuned from the bottom as shown in the photograph.

All coils except L7, L14, and L15 are aligned using a low input signal reading between 5 and 10 ua on meter position 1.

Align the receiver on the lowest carrier frequency in multiple frequency models.

455 KC DISCRIMINATOR ALIGNMENT

Motorola S1056A-9A or TU546 Series Test Set supplying 455 kc output.

STEP	METER SWITCH POSITION	ADJUSTMENT	METER READING	PROCEDURE
1	5	L14	PEAK	Inject a 455 kc crystal controlled signal through a 2000 uuf capacitor to the input of the 455 kc filter. Tune L14, the last limiter, for a peak reading on meter position 5.
2	4	L15	ZERO	While a strong signal is indicated on meter position 1, tune L15 exactly to "zero".

5.5 MC IF ALIGNMENT

Motorola T1034C FM Signal Generator supplying 5.5 mc i-f output on range 2.

3	1	L13	PEAK	Inject a 5.5 mc i-f signal through a 500 uuf capacitor to the base of the 1st mixer. Tune L13 (clockwise) to the 2nd (larger) peak on meter position 1. A small peak will be observed while tuning through the 2nd oscillator frequency (5.955 mc).
4	1	L12	PEAK	Tune L12 for a peak reading on meter position 1.
5	1	L11	PEAK	Inject a 5.5 mc i-f signal through a 2 uuf capacitor to the base of 1st mixer. Tune L11 for a peak reading on meter position 1.
6	1	L10	PEAK	Tune L10 for a peak reading on meter position 1.

1ST OSCILLATOR ALIGNMENT

7				Set the 1st oscillator warping trimmers so that the screwdriver notch is in line with the mounting terminals.
8	6	L7	PEAK	Tune L7 clockwise for a peak reading on meter position 6, then detune it counterclockwise by 0.5 ua on meter position 6.

MULTIPLIER ALIGNMENT

Motorola T1034C FM Signal Generator supplying carrier frequency ($f_c = f_m - 5.5$ mc for 136-150.8 mc range and $f_c = f_m + 5.5$ mc for 150.8-174 mc range).

STEP	METER SWITCH POSITION	ADJUSTMENT	METER READING	PROCEDURE
9	1	L8	PEAK	Inject a signal at the carrier frequency (f_c) through a 2 uuf capacitor to the base of the 1st mixer. Tune L8 for a peak reading on meter position 1.
10	1	L9	PEAK	Tune L9 for a large peak reading on meter position 1. (A small flat spot may be noted as the coil is tuned through the carrier frequency.)

RF DECK ALIGNMENT

Motorola T1034C FM Signal Generator supplying carrier frequency (f_c).

11	1	L1-L6	PEAK	136-150.8 MC Models: Turn L1 through L5 clockwise to near end of travel (approximately two turns from bottom). 150.8-174 MC Models: Turn L1 through L5 counterclockwise to near end of travel (approximately two turns from top). Inject a signal at the carrier frequency to the antenna receptacle. Tune L1, L2, L3, L4, L5 and L6, in that order, for a maximum meter indication in position 1. Repeat this tuning sequence at least three times. Switch the test set to position 4 to check that the signal generator is still on exact "0". When tuning L1 through L5 two peaks may be obtained. Use the peak which gives the maximum meter indication. In most cases the first peak will give the maximum indication.

ADDITIONAL CHECKS

12	4	Oscillator Warping Trimmer(s)	ZERO	While receiving a carrier signal from a transmitter on the air, adjust the oscillator warping trimmers for a "zero" reading on meter position 4. On multiple frequency models, the frequency selector switch must be placed in the proper position.
13	--	--	--	Measure the 20 db quieting as described in the MAINTENANCE section of this manual, to insure that the receiver is functioning properly.

INTERFERENCE REJECTION TUNING PROCEDURE

INTRODUCTION

The r-f preselector used in this receiver has a wide acceptance bandwidth and steep skirt selectivity to provide attenuation of signals outside the carrier bandwidth. Since the "nose" of the receiver r-f bandwidth is flat, it is possible to retune the r-f preselector to reject some interfering signals with a minimum effect on radio sensitivity. These interfering signals may be located above or below the desired frequency.

TEST EQUIPMENT REQUIRED

1. Motorola Model S1056A-9A Portable Test Set with Motorola Model TKN6025A Adapter Cable (available on separate order), or equivalent.

2. Motorola Model T1034C Signal Generator, or equivalent.

3. Motorola Model T1012A Power Supply, or equivalent.

4. Motorola TLN6485A Tuning Tool Kit

PROCEDURE

1. If the interfering signals are above the desired frequency, the preselector must be tuned to a lower frequency. To tune the preselector lower, turn the tuning section trimmer screws (L2, L3, L4) clockwise.

   If the interfering signals are below the desired frequency, the preselector must be tuned to a higher frequency. To tune the preselector higher, turn the tuning section trimmer screws counterclockwise.

2. Set the signal generator to supply the r-f carrier and set up the portable test set as described below.

   (1) Set the function selector switch to the RCVR position.

   (2) Connect the 20-pin plug end of the metering cable into the receptacle on the test set. Connect the TKN6025A Adapter Cable to the other end of the metering cable. Plug the adapter cable into the metering socket on the receiver. The 20-pin metering cable plug acts as the internal battery on-off switch. Pins 19 and 20 on the plug are jumpered. Connecting the plug to the test set socket completes the battery circuit. To conserve battery life when not using the test set, either disconnect the meter cable from the test set, or set the Oscillator and Meter Reversing Switch to OFF and put the Position Selector Switch to any position except 11 or 13.

   (3) Place the oscillator and meter reversing switch in the 455 kc position.

   (4) Place the Position Selector Switch in position 4 and check to see that the signal generator is on frequency. Set the Position Selector Switch to position 1. (A periodic check should be made while performing this tuning procedure to ascertain that the signal generator is on frequency.)

3. Set the signal generator input level for a 10 microampere reading on meter position 1.

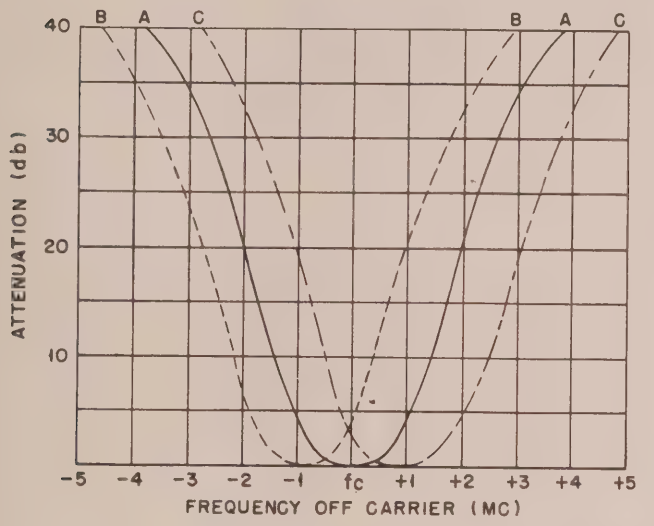
4. Detune L4 in the direction determined in step 1 for a reduction of approximately 1 microampere, maximum.

5. Detune L3 and L2, in that order, for a reduction of 1 ua each, using the above procedure

NOTE

Do not tune L1, L5 or L6 at all in this procedure.

A decrease of approximately 1 microampere for a tuning change in each adjustment represents a shift in the center frequency of the preselector of approximately 1 megacycle. If the frequency of the interfering signals can be determined, and the amount of shift desired is known, the preselector can be tuned for a shift less than 1 megacycle by detuning L4, L3 and L2 from peak tuning, each for a decrease in meter indication which is the same portion of 1 microampere as the desired frequency shift is a portion of 1 megacycle.



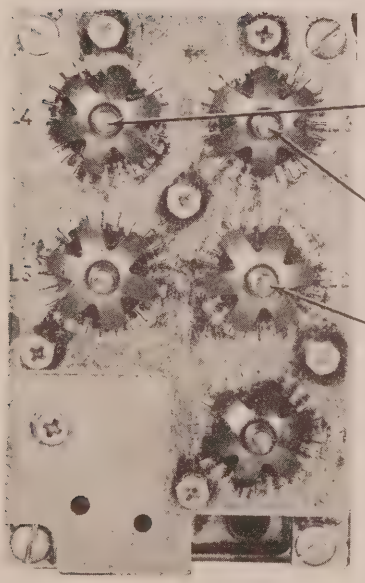
CURVE A-TUNED TO PEAK ON CARRIER.

CURVE B-TUNED BELOW CARRIER FOR HIGH FREQUENCY REJECTION.

CURVE C- TUNED ABOVE CARRIER FOR LOW FREQUENCY REJECTION.

AEPD-7710-O

R-F PRESELECTOR SELECTIVITY CURVES
SHOWING THE EFFECT OF RETUNING
FOR INTERFERENCE REJECTION



AEPD-9347-O

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE
01			VARIOUS COMPONENT CHANGES MADE AT START O PRODUCTION
A	TUD1191BB-1 TUD1192BB-1	R66	WAS 6S2068, 33K FOR "QUIK-CALL" ONLY
B	TUD1111BB-1 TUD1112BB-1 TUD1131BB-1 TUD1132BB-1 TUD1191BB-2 TUD1192BB-2 TUD1201AB-1 TUD1202AB-1	R98	ADDED 4.7K
C	TLN6654B-1	Q6	WAS 48R869003, TYPE M9003
D	TUD1111BB-2 TUD1112BB-2 TUD1131BB-2 TUD1132BB-2 TUD1191BB-3 TUD1192BB-3 TUD1201AB-2 TUD1202AB-2	V102	WAS 97R131A01, 844 OR 95T270A04, 6EA
		V103	WAS 95R133A01, 84 or 95T164A02, 12BY
E	TLD6321A-1 TLD6322A-3 TLD6323A-2	R99	ADDED 4.7K
F	TKN6100A-1	F402	WAS 65R10266, 10 AMP
G	TLD6321A-2 TLD6322A-4 TLD6323A-3	Q1	WAS 48R869108, M9108
		C1	WAS 21K840046, 100 uuf
		R2	WAS 6K128904, 18K
H	TUD1111BB-3 TUD1112BB-3 TUD1131BB-3 TUD1132BB-3 TUD1191BB-4 TUD1192BB-4 TUD1201AB-3 TUD1202AB-3	C156	ADDED 1500 uuf
		R139	ADDED 3.3K
		R140	ADDED 4.7K
		R120	WAS 6S6487, 39K
		R109	WAS 6R6400, 13K
		R110, 112	WERE 6S5775, 680K
		R123	WAS 6S5618, 3.9K
		R127, 130	WERE 6R6326, 100
		R116	WAS 6R2089, 1.8K
		R132	WAS 6R6299, 10K
		C203	WAS 23D82178B03, 400 V
J	TLD6362B-1 TLN6654B-2	C9, 10, 11, 40, 43, 56, 63, 83, 85, 86, 304	WERE 21D82428B02, +70-30%; 100 V
		C21, 30, 46, 49	WERE 21D82428B18, +70-30%; 100 V
K	TLD6361B-2 TLD6362B-2 TLD6531B-2 TLD6532B-2 TLD6571B-2 TLD6572B-2	Y2	WAS G04 (5.955 MC)
L	TLD6321A-3 TLD6322A-5 TLD6323A-4	C1	WAS 21K8[illegible]9696, 20 u
		C4M	WAS 21R122173, 5.6 u
		C4L	ADDED
		L6L	WAS 24V80901A66, C
		L6M	WAS 24V80901A67, C
		L6H	WAS 24V80901A73, C
		Q1	WAS 48R869405, M94
		R2	WAS 6K129433, 5.6K
		R99	REMOVED 6S127804, 4.7K. WAS CONNECTED IN PARALLEL WITH C4
		C89L, M	ADDED 1.5 uuf
		C89H	ADDED 1.2 uuf
L1	TLD6321A-3 TLD6322A-5 TLD6323A-4	C160H	WAS C89H
		C160L, M	WERE C89L, 89M
M	TUD1111BB-4 TUD1112BB-4 TUD1131BB-4 TUD1132BB-4 TUD1191BB-5 TUD1192BB-5 TUD1201AB-4 TUD1202AB-4	C157	ADDED 8 uuf

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Z1	TFN6015AS	FILTER, IF : bandpass: ±5 kc

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
O			VARIOUS COMPONENT CHANGES MADE AT START OF PRODUCTION		
A	TUD1191BB-1 TUD1192BB-1	R66	WAS 6S2068, 33K FOR "QUIK-CALL" ONLY	PARTS LIST	
B	TUD1111BB-1 TUD1112BB-1 TUD1131BB-1 TUD1132BB-1 TUD1191BB-2 TUD1192BB-2 TUD1201AB-1 TUD1202AB-1	R98	ADDED 4.7K	T2 PRIMARY	AUDIO OUTPUT BD, EPD-11308-A
C	TLN6654B-1	Q6	WAS 48R869003, TYPE M9003	455 KC IF AMPL-1	455 KC IF BD, EPD-11283-A
D	TUD1111BB-2 TUD1112BB-2 TUD1131BB-2 TUD1132BB-2 TUD1191BB-3 TUD1192BB-3 TUD1201AB-2 TUD1202AB-2	V102	WAS 97R131A01, 8445; OR 95T270A04, 6EA8	DOUBLER, TRIPLER	NONE
		V103	WAS 95R133A01, 8448 or 95T164A02, 12BY7A	PARTS LIST	
E	TLD6321A-1 TLD6322A-3 TLD6323A-2	R99	ADDED 4.7K	Q1 COLLECTOR	NONE
F	TKN6100A-1	F402	WAS 65R10266, 10 AMP	P401-1	NONE
G	TLD6321A-2 TLD6322A-4 TLD6323A-3	Q1	WAS 48R869108, M9108	RECEIVER RF AMP	NONE
		C1	WAS 21K840046, 100 uuf	Q1 BASE	
		R2	WAS 6K128904, 18K		
H	TUD1111BB-3 TUD1112BB-3 TUD1131BB-3 TUD1132BB-3 TUD1191BB-4 TUD1192BB-4 TUD1201AB-3 TUD1202AB-3	C156	ADDED 1500 uuf	V102A-6	NONE
		R139	ADDED 3.3K		
		R140	ADDED 4.7K	V101A-OSC.	
		R120	WAS 6S6487, 39K	V102A-6	
		R109	WAS 6R6400, 33K	V105A-1	
		R110, 112	WERE 6S5775, 680K	V105B-6, 7	
		R123	WAS 6S5618, 3.9K	T102	
		R127, 130	WERE 6R6326, 100	V103, V104 GRID CIRCUIT	
		R116	WAS 6R2089, 1.8K	V101B PLATE CIRCUIT	
		R132	WAS 6R6299, 10K	V104 GRID CIRCUIT	
		C203	WAS 23D82178B03, 400 V	PARTS LIST	
J	TLD6362B-1 TLN6654B-2	C9, 10, 11, 40, 43, 56, 63, 83, 85, 86, 304	WERE 21D82428B02, +70-30%; 100 V	PARTS LIST	
		C21, 30, 46, 49	WERE 21D82428B18, +70-30%; 100 V		
K	TLD6361B-2 TLD6362B-2 TLD6531B-2 TLD6532B-2 TLD6571B-2 TLD6572B-2	V2	WAS G04 (5.955 MC)	Q4 BASE	PREAMP. CKT. BD, EPD-11286-A
L	TLD6321A-3 TLD6322A-5 TLD6323A-4	C1	WAS 21K859696, 20 uuf	Q1 BASE	NONE
		C4M	WAS 21R122173, 5.6 uuf	PARTS LIST	
		C4L	ADDED		
		L4L	WAS 24V80901A66, CB1		
		L6M	WAS 24V80901A67, CB2		
		L6H	WAS 24V80901A73, CC1		
		Q1	WAS 48R869405, M9405	RF AMPL.	
		R2	WAS 6K129433, 5.6K	Q1 BASE	
		R99	REMOVED 6S127804, 4.7K. WAS CONNECTED IN PARALLEL WITH C4		
		C89L, M	ADDED 1.5 uuf		
		C89H	ADDED 1.2 uuf		
L1	TLD6321A-3 TLD6322A-5 TLD6323A-4	C160H	WAS C89H	Q1 BASE	NONE
		C160L, M	WERE C89L, 89M		
M	TUD1111BB-4 TUD1112BB-4 TUD1131BB-4 TUD1132BB-4 TUD1191BB-5 TUD1192BB-5 TUD1201AB-4 TUD1202AB-4	C157	ADDED 8 uuf	K201-1	NONE

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

LEGEND
L = 136-150.8 MC
M = 150.8-162 MC
H = 162-172 MC

RECEIVER EPD-12344-J

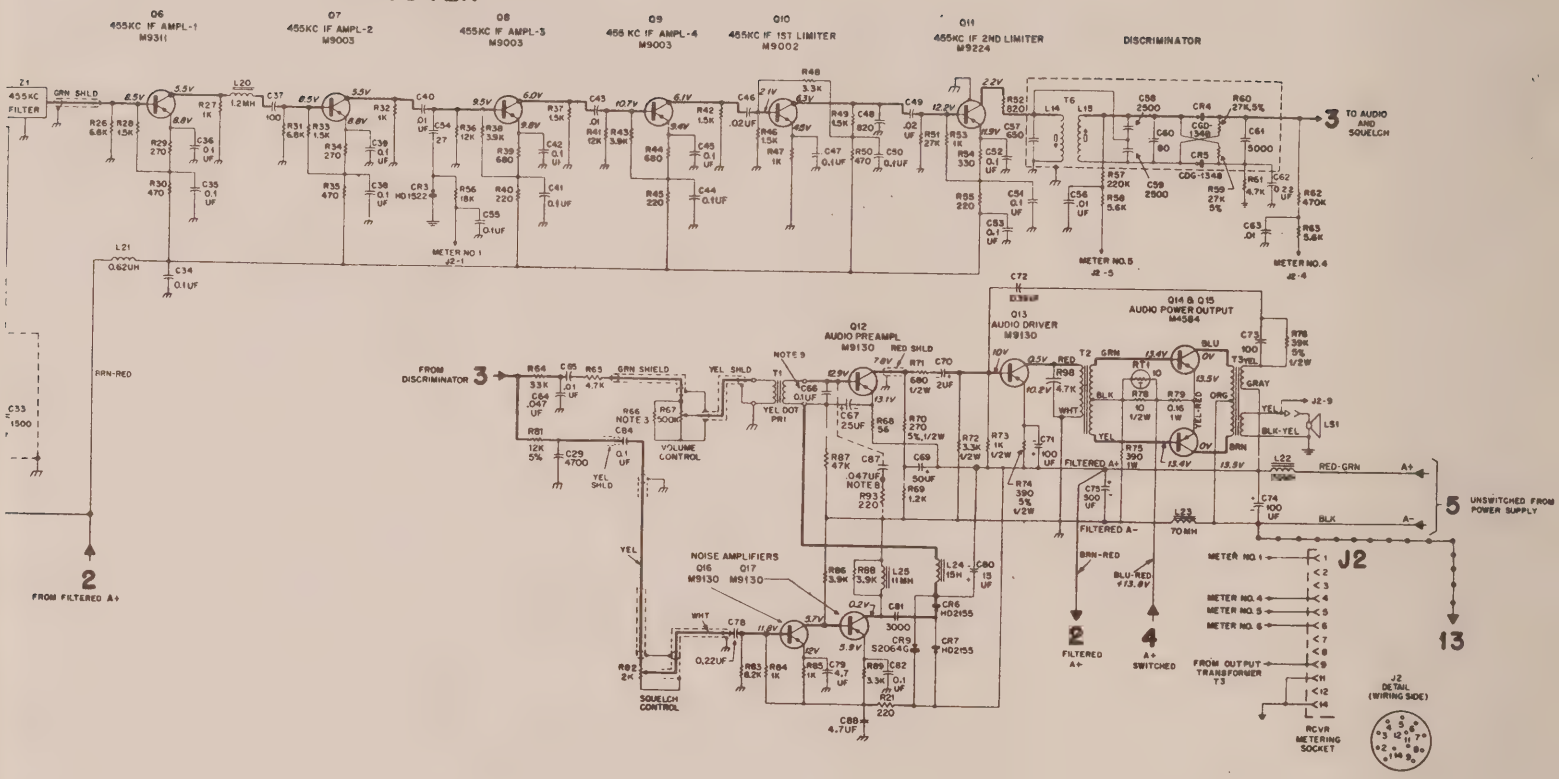
		CAPACITOR, fixed: uf; ±5%; 500 v; unl stated
C1	21K840046	100 uuf; ±10%
C2, 3	21B861219	1000 uuf GMV
C4L, 16	21R410063	10 uuf ±0.5 uuf; NP0
C4M	21K864746	6 uuf; N150
C4H	21K857337	7.5 uuf ±0.5 uuf; NP0
C6, 7, 28, 33	21C82187B11	1500 uuf ±10%; 100 v
C8	21K840846	15 uuf NP0
C9, 10, 11, 40, 43, 56, 63, 83, 85, 86, 304	21D82428B59	.01 +80-20%; 200 v
C12, 84	8D82905G07	0.1 ±10%; 25 v
C13, 301, 302, 303	20K867490	var; 8-50 uuf; N750
C14	21K865942	18 uuf; N470
C15, 37	21K831125	100 uuf ±10%; 300 v N750
C17L	21D82355B28	13 uuf; N470
C17M, 17H	21K864739	12 uuf; N470
C18	21K830201	0.3 uuf
C19L	21D859696	20 uuf; N470
C19M, 19H	21K867144	18 uuf; N750
C20	21D82355B15	24 uuf; N750
C21, 30, 46, 49	21D82428B26	.02 +80-20%; 200 v
C22, 29	21D82428B09	.0047 ±10%; 100 v
C23, 24, 26	21K859939	110 uuf
C25, 160H	21C82450B08	1.2 uuf
C27	21K859941	130 uuf
C31	21K848978	190 uuf ±3%
C32	21K849338	40 uuf ±10%; NP0
C34, 35, 36, 38, 39, 41, 42, 44, 45, 47, 50, 51, 52, 53, 55, 66, 82	8D83293B01	0.1 ±10%; 50 v (C66 not used in "Quik-Call" Models)
C48	21C837745	820 uuf ±10%
C54	21K410089	27 uuf ±10%
C57	21K848236	650 uuf 300 v
C58, 59	21K859773	2500 uuf
C60	21D82133G28	80 uuf ±10%; N1500
C61	21D82428B15	.005 ±10%
C62, 78	8D83293B02	0.22 ±10%; 50 v
C64	8D82905G04	.068 ±10%; 25 v
C65	8D83293B05	.01 ±10%; 50 v
C67	23D83210A01	25 +150-10%; 25 v
C69	23D82601A05	50 +150-10%; 25 v
C70	23D83210A02	2 +150-10%; 25 v
C71	23D83210A03	100 +150-10%; 6 v
C72	8D83293B03	0.39 ±10%; 50 v
C73	21K840046	100 uuf ±10%
C74	23D82601A09	100 +150-10%; 25 v
C75	23D82394A06	500 +150-10%; 25 v
C78	8D83293B02	0.22 ±10%; 50 v
C79, 88	23K865137	4.7 ±20%; 25 v
C80	23K865136	15 uf ±20%; 25 v
C81	21C82187B16	3000 ±10%; 1000 v
C87	8D82905G03	.047; 25 v ("Quik-Call" only)
C160L, 160M	21D82450B13	1.5 uuf
		SEMICONDUCTOR DEVICE, diode (NOTE I)
CR1	48C82617C01 or 48C82617C03	silicon silicon
CR2	48C82363E01	silicon
CR3	48C82178A04	germanium
CR4, 5	48C82139G01	germanium
CR6, 7	48K855216	germanium
CR9	48C82420C07	silicon

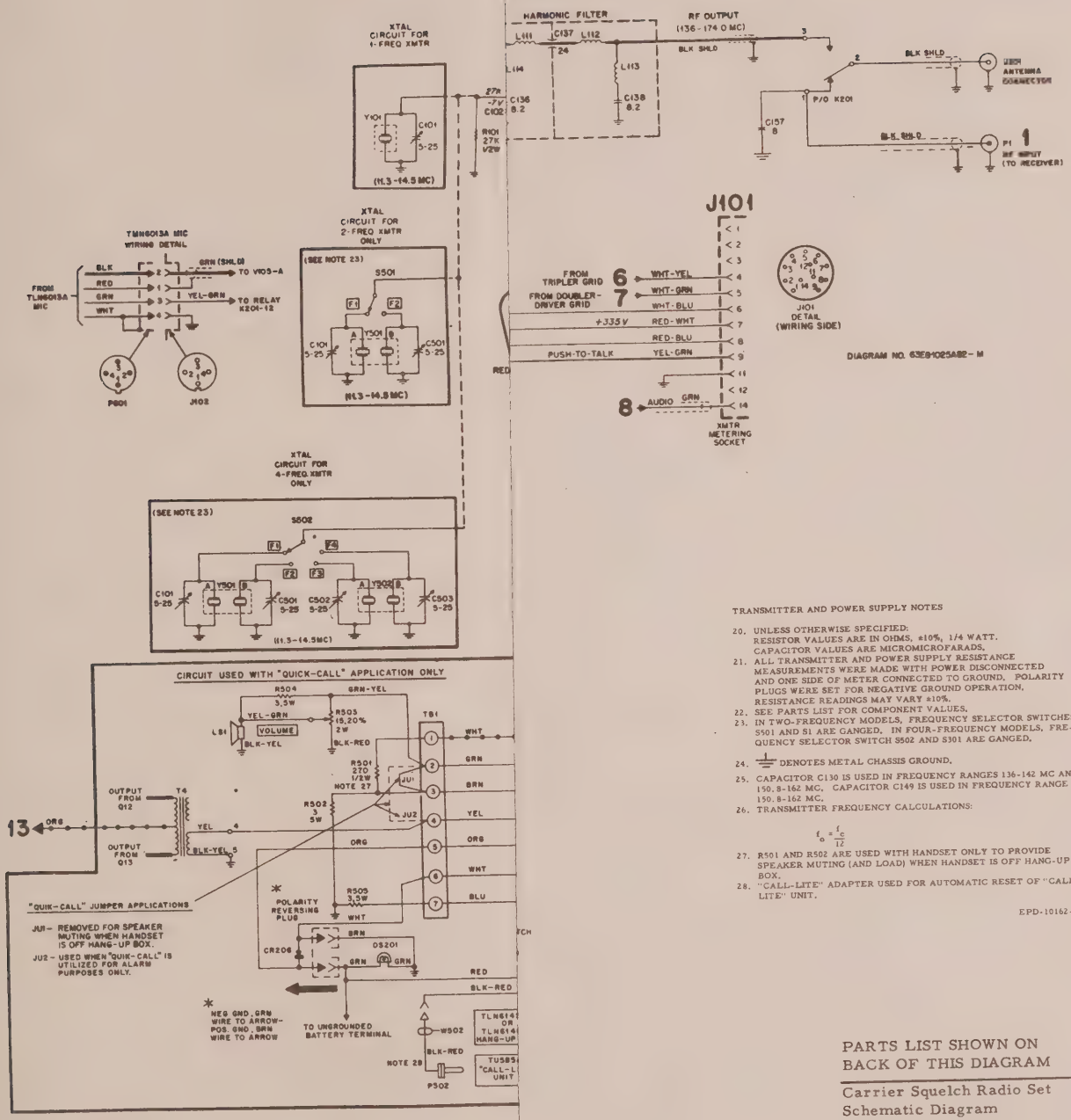
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CONNECTOR, receptacle:
J1	9C87120	female; coaxial; phono type
J2	9C82748G01	female; 12 contact
		COIL, RF: unl stated
L1L	24B82890D02	coded CB4
L1M	24B82890D04	coded CB6
L1H	24B82890D06	coded CB8
L2L, 3L, 4L,	24B82890D01	coded CB3
L2M, 3M, 4M	24B82890D03	coded CB5
L2H, 3H, 4H	24B82890D05	coded CB7
L5L	24B82890D07	coded CB9
L5M	24B82890D08	coded CC1
L5H	24B82890D09	coded CC2
L6L	24V80906A20	coded C01
L6M	24V80906A21	coded C02; incl C4M, C6
L6H	24V80906A19	coded CP9; incl C4H, C6
L7	24V80902A29	incl 1A82354B14 CORE
L8L	24V80902A92	incl C17L, CR2 and 1A82354B13 CORE
L9L	24V80902A93	incl C19L, C20 and 1A82354B13 CORE
L8M, 8H	24V80902A33	incl C17, C86, CR2 and 1A82354B13 CORE
L9M, 9H	24V80902A34	incl C19, C20 and 1A82354B13 CORE
L17, 301	24D82135G04	choke; 2.6 uh; 5%
	or24B82835G03	choke; 2.6 uh
L18, 302	24B82835G04	choke; 1.5 uh; 5%
	or24D82135G05	choke; 1.5 uh
L19, 21	24D82135G01	0.62 mh
L20	24C82835G18	choke; 1.2 mh
L22, 23	25B82878A03	choke; 70 mh
L24	25C82448C01	AF; choke; 15 h; res 190 max
L25	24C82835G19	choke; 11 mh
L303, 305	24B82835G01	choke; 2.6 uh
L304, 306	24B82835G02	choke; 1.5 uh
P1	28A474006	CONNECTOR, plug: male; coaxial; phono type
		TRANSISTOR: (NOTE I)
Q1	48R869223	P-N-P; M9223
Q2	48R869109	P-N-P; M9109
Q3	48R869203	P-N-P; M9203
Q4, 7, 8, 9	48R869003	P-N-P; M9003
Q5	48R869204	P-N-P; M9204
Q6	48R869311	P-N-P; M9311
Q10	48R869002	N-P-N; M9002
Q11	48R869224	P-N-P; M9224
Q12, 13, 16, 17	48R869120	P-N-P; M9120
Q14, 15	48K134584	P-N-P; M4584
		RESISTOR, fixed; ±10%; 1/4 w; unl stated
R1, 48, 49.89	6S129231	3.3K
R2, 56	6K128904	18K
R3	6K129432	820
R4, 83	6S128686	8.2K
R5	6S129237	6.8K ±5%
R6	6S129982	5.6K ±5%
R7	6S128689	2.2K
R8, 16	6S129753	100
R9, 92	6S129805	1K ±5%
R10	6S129662	180
R11, 20, 58, 63	6S129433	5.6K
R12	6S129668	10K ±5%
R13	6S129983	8.2K ±5%
R14	6R6229	1K; 1/2 w
R15, 18, 27, 32, 47, 53, 84, 85	6S127802	1K
R17	6S129235	1.2K
R19, 38, 43, 86, 88	6S129232	3.9K
R21, 40, 45, 55	6S127800	220
R22, 64	6S127807	33K
R23	6S127805	15K
R24, 26, 31	6S128687	6.8K
R25, 61, 65	6S127804	4.7K
R28, 33, 37, 42, 46	6R127803	1.5K
R29, 34	6R129752	270
R30, 35, 50	6R127801	470
R36, 41	6R129230	12K
R39, 44	6R128599	680

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R51	6R127806	27K
R52	6S129818	820 ±5%
R54	6R129775	330
R57	6R129147	220K
R59, 60	6R129886	27K ±5%
R62	6R129148	470K
R66	6R6048	47K; 1/2 w
	or6R6480	22K ±5%; 1/2 w used in "Quik-Call Models Only
R67	18C82810C02	var; 500K ±30%; 0.12 w incl S202
	or18K848957	var; 500K ±20%; 0.2 w; incl S202 (used in "Quik-Call" Models Only)
R68	6S129860	56
R69	6S6393	1.2K; 1/2 w
R70	6R400057	270 ±5%; 1/2 w
R71	6R6040	680; 1/2 w
R72	6S5581	3.3K; 1/2 w
R73	6S6229	1K; 1/2 w
R74	6S400804	390 ±5%; 1/2 w
R75	6S131657	390 ±5%; 1 w
R76	6S400076	39K ±5%; 1/2 w
R78	6S5621	10; 1/2 w
R79	17C82350A05	0.16; 1 w
R81	6S129887	12K ±5%
R82	18D82515B04	var; 2K; ±30%; 0.5 v
R87, 90	6S128902	47K
R91	6R129226	100K
R93	6R6270	220; 1/2 w (used in "Quik-Call" Models Only)
R98	6R6080	4.7K; 1/2 w
		THERMISTOR:
RT1	6C82769A01	10 ohms ±10% @ 25°C
		SWITCH, rotary:
S1	40C82839C02	single pole; 2 position non-shorting
S2	40C82556D02	single pole; 4 position non-shorting
		TRANSFORMER, AF:
T1	25B82454G01	windings as follows: pri.: (YEL dot); res 2300 ±10% sec.: res 147 ±10%
T2	25C82431C04	windings as follows: pri.: RED, WHT; res 65 ±10% sec.: GRN, YEL w/BLK tap; total res 4.2 ±10%
T3	25C82811C03	windings as follows: pri.: BLU, BRN w/ORG tap; total res 0.79 +10%-20% sec No. 1: (lug terminals); res 0.23 ±10% sec No. 2: GRAY, YEL; res 3 ±10%
		TRANSFORMER, IF; 5.5 mc:
T4	24V80902A24	(L10 & L11); incl C23, C24, C25, R18 and (2) 1A82354B11 CORE, tuning
T5	24V80902A25	(L12 & L13): incl C26, C27, C28 and (2) 1A82354B11 CORE, tuning
		TRANSFORMER, discriminator 455 KC:
T6	24V80902A28	(L14 & L15); incl (2) 1K868663 CORE, tuning
		SOCKET, transistor:
XQ14, 15	9D82673A01	2 contact
		SOCKET, crystal:
XY1, 301, 302	9C855941	6 contact
		CRYSTAL UNIT, quarts: (NOTE II)
*Y1	ZMM-50A	incl 1 crystal (150.8-174 mc); used in 1-freq rcvrs only
	orZMM-66A	incl 1 crystal (136-150.8 mc); used in 1-freq rcvrs
Y2	G08	5.045 mc
*Y301, 302	ZMM-50-50A or ZMM-66-66A	incl 2 crystals (150.8-174 mc); used in 2-freq & 4-freq rcvrs incl 2 crystals (136-150.8 mc) used in 2-freq & 4-freq rcvrs
		*NOTE: includes thermostat and 12 volt heater

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Z1	TFN6015AS	FILTER, IF: bandpass: ±5 kc

RECEIVER


Q6 455KC IF AMPL-1 M9311
Q7 455KC IF AMPL-2 M9003
Q8 455KC IF AMPL-3 M9003
Q9 455 KC IF AMPL-4 M9003
Q10 455KC IF 1ST LIMITER M9002
Q11 455KC IF 2ND LIMITER M9224
DISCRIMINATOR
Z1 455KC FILTER
GRN SHLD
L20 1.2MH
L21 0.62UH
C34 0.1UF
C33 1500
FROM FILTERED A+
2
RRN-RED
TO AUDIO AND SQUELCH
3
METER NO.1 Ω1
METER NO.5 Ω5
METER NO.6 Ω6
METER NO.4 Ω4
CR3 HD1522
CR4 CDG-1348
CR5 CDG-1348
T6
L14
L15
C59 2800
C60 80
C61 5000
C62 0.22 UF
R57 220K
R58 5.6K
R59 27K 5%
R60 27K 5%
R61 4.7K
R62 470K
R63 5.6K
C63 .01
C54 0.1 UF
C56 .01 UF
C57 650
C58 2800
C52 0.1 UF
C53 0.1 UF
R52 8201
R53 1K
R54 330
R55 220
R51 27K
R48 3.3K
R49 4.5K
R50 470
C48 820
C49 .02 UF
C50 0.1UF
R46 1.5K
R47 1K
C47 0.1UF
C46 .02UF
R42 1.5K
R43 3.9K
R44 680
R45 220
C45 0.1 UF
C44 0.1UF
R41 12K
C43 .01
R36 12K
R38 3.9K
R39 680
C42 0.1 UF
C41 0.1UF
R37 1.5K
R40 220
R56 18K
C55 0.1UF
C40 .01 UF
C54 27
R31 6.8K
R33 1.5K
R34 270
R35 470
C39 0.1 UF
C38 0.1 UF
R32 1K
C37 100
R26 6.8K
R28 15K
R29 270
R30 470
C36 0.1 UF
C35 0.1 UF
R27 1K
C72 .033UF
Q13 AUDIO DRIVER M9130
Q14 & Q15 AUDIO POWER OUTPUT M4584
Q12 AUDIO PREAMPL M9130
RED SHLD
FROM DISCRIMINATOR
3
R64 33K
C65 .01 UF
R65 4.7K
GRN SHIELD
C64 .047 UF
R66 NOTE 3
R67 500K
VOLUME CONTROL
R81 12K 5%
C29 4700
C84 0.1 UF
YEL SHLD
YEL SHLD
T1
YEL DOT PRI
C66 0.1UF
C67 25UF
R68 56
R87 47K
C87 .047UF NOTE 8
R93 220
C69 50UF
R69 1.2K
C70 2UF
R70 270 5% 1/2W
R71 680 1/2W
R72 3.3K 1/2W
R73 1K 1/2W
C71 100 UF
R74 390 5% 1/2W
R98 4.7K
T2
T3
RT1 10
R78 10 1/2W
R79 0.16 1W
R75 390 1W
C73 100
R76 39K 5% 1/2W
C75 500 UF
C74 100 UF
L22
L23 70MH
FILTERED A+
FILTERED A-
RED-GRN
BLK
A+
A-
5
UNSWITCHED FROM POWER SUPPLY
J2-9
LS1
BLK-YEL
YEL-RED
BRN-RED
BLU-RED
2
FILTERED A+
4
A+ SWITCHED
J2
METER NO.1
METER NO.4
METER NO.5
METER NO.6
FROM OUTPUT TRANSFORMER T3
13
RCVR METERING SOCKET
J2 DETAIL (WIRING SIDE)
NOISE AMPLIFIERS
Q16 M9130
Q17 M9130
R86 3.9K
R88 3.9K
L25 11MH
L24 15H
C80 15 UF
CR6 HD2155
CR7 HD2155
CR9 S2064G
C81 3000
C78 0.22UF
R82 2K
SQUELCH CONTROL
R83 8.2K
R84 1K
R85 1K
C79 4.7 UF
R89 3.3K
C82 0.1 UF
R21 220
C88 4.7UF


HARMONIC FILTER
RF OUTPUT (136-174.0 MC)
XTAL CIRCUIT FOR 1-FREQ XMTR
XTAL CIRCUIT FOR 2-FREQ XMTR ONLY
XTAL CIRCUIT FOR 4-FREQ XMTR ONLY
TMN6013A MIC WIRING DETAIL
J101
J101 DETAIL (WIRING SIDE)
DIAGRAM NO. 63E81025A82-M
CIRCUIT USED WITH "QUICK-CALL" APPLICATION ONLY
"QUIK-CALL" JUMPER APPLICATIONS
JU1- REMOVED FOR SPEAKER MUTING WHEN HANDSET IS OFF HANG-UP BOX.
JU2- USED WHEN "QUIK-CALL" IS UTILIZED FOR ALARM PURPOSES ONLY.
TO UNGROUNDED BATTERY TERMINAL
XMTR METERING SOCKET

TRANSMITTER AND POWER SUPPLY NOTES

20. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 WATT. CAPACITOR VALUES ARE MICROMICROFARADS.
21. ALL TRANSMITTER AND POWER SUPPLY RESISTANCE MEASUREMENTS WERE MADE WITH POWER DISCONNECTED AND ONE SIDE OF METER CONNECTED TO GROUND. POLARITY PLUGS WERE SET FOR NEGATIVE GROUND OPERATION. RESISTANCE READINGS MAY VARY ±10%.
22. SEE PARTS LIST FOR COMPONENT VALUES.
23. IN TWO-FREQUENCY MODELS, FREQUENCY SELECTOR SWITCHES S501 AND S1 ARE GANGED. IN FOUR-FREQUENCY MODELS, FREQUENCY SELECTOR SWITCH S502 AND S301 ARE GANGED.
24. ⏚ DENOTES METAL CHASSIS GROUND.
25. CAPACITOR C130 IS USED IN FREQUENCY RANGES 136-142 MC AND 150.8-162 MC. CAPACITOR C149 IS USED IN FREQUENCY RANGE 150.8-162 MC.
26. TRANSMITTER FREQUENCY CALCULATIONS:

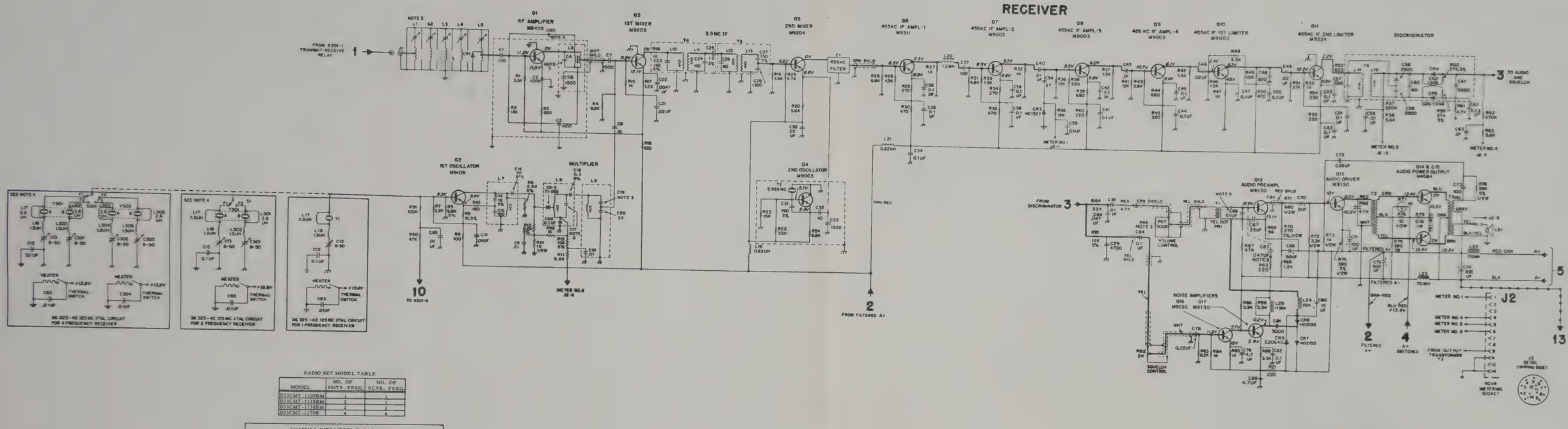
$$f_o = \frac{f_c}{12}$$

27. R501 AND R502 ARE USED WITH HANDSET ONLY TO PROVIDE SPEAKER MUTING (AND LOAD) WHEN HANDSET IS OFF HANG-UP BOX.
28. "CALL-LITE" ADAPTER USED FOR AUTOMATIC RESET OF "CALL-LITE" UNIT.

EPD-10162-O

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Carrier Squelch Radio Set
Schematic Diagram
Motorola No. 63E81025A82-M
(Sheet 2 of 2)
5/2/67-GM



RADIO SET MODEL TABLE

MODEL	NO. OF XMTR. FREQ.	NO. OF RCVR. FREQ.
D33CMT-1100BM	1	1
D33CMT-1110BM	2	1
D33CMT-1130BM	2	2
D33CMT-1170B	4	4

CHASSIS & KITS MODEL TABLE

UNIFIED CHASSIS

SERIES	MODEL	SUFFIX	BASIC CHASSIS	FREQ. RANGE
TUD1110BB	TUD1111BB	4	TLN6686A	136-150.8 MC
	TUD1112BB	4	TLN6652A	150.8-174 MC
TUD1130BB	TUD1131BB	4	TLN6687A	136-150.8 MC
	TUD1132BB	4	TLN6718A	150.8-174 MC
TUD1200AB	TUD1201AB	4	TLN8007A	136-150.8 MC
	TUD1202AB	4	TLN8008A	150.8-174 MC
TUD1190BB	TUD1191BB	5	TLN6924A	136-150 MC *
	TUD1192BB	5	TLN6816A	150.8-174 MC

FREQUENCY SELECTOR KITS

MODEL	SUFFIX	DESCRIPTION
TLN6705A		2-FREQ. XMTR. KIT
TLN6707A		2-FREQ. XMTR. & RCVR KIT

CABLE KIT

MODEL	SUFFIX	DESCRIPTION
TKN6105A		12 VDC POWER INPUT CABLE

MISCELLANEOUS KITS

MODEL	SUFFIX	DESCRIPTION
TLD6321A	3	RECEIVER RF DECK (136-150.8 MC)
TLD6322A	5	RECEIVER RF DECK (150.8-162 MC)
TLD6323A	4	RECEIVER RF DECK (162-174 MC)
TMN6019A		WIRED-IN TRANSISTORIZED MICROPHONE
TMN6013A		PLUG-IN TRANSISTORIZED MICROPHONE
TKN6201A		CABLE (W501)
TLN6510A		MISCELLANEOUS PARTS
TLN6357A		CALL LIGHT ADAPTER KIT
TLN6580A		HANDSET ADAPTER

* MODELS USED ONLY FOR "QUIK-CALL" APPLICATION

EPD-11307-F

RECEIVER NOTES

1. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 WATT. CAPACITOR VALUES ARE IN MICROMICROFARADS.
2. ALL RECEIVER VOLTAGES ARE MEASURED WITH RESPECT TO RECEIVER PRINTED CIRCUIT BOARD GROUND.
3. SEE PARTS LIST FOR COMPONENT VALUES.
4. IN TWO-FREQUENCY MODELS, FREQUENCY SELECTOR SWITCHES S1 AND S501 ARE GANGED. IN FOUR-FREQUENCY MODELS, FREQUENCY SELECTOR SWITCHES S301 AND S502 ARE GANGED.
5. ⏚ DENOTES RECEIVER PRINTED CIRCUIT BOARD GROUND

   ⏚ DENOTES METAL CHASSIS GROUND.
6. WHEN SERVICING THE RADIO SET DO NOT SHORT THE RECEIVER CHASSIS TO THE MAIN CHASSIS OR VEHICLE FRAME. DOING THIS WILL BLOW THE BATTERY FUSE IN POSITIVE GROUND INSTALLATIONS.
7. RECEIVER FREQUENCY CALCULATIONS:

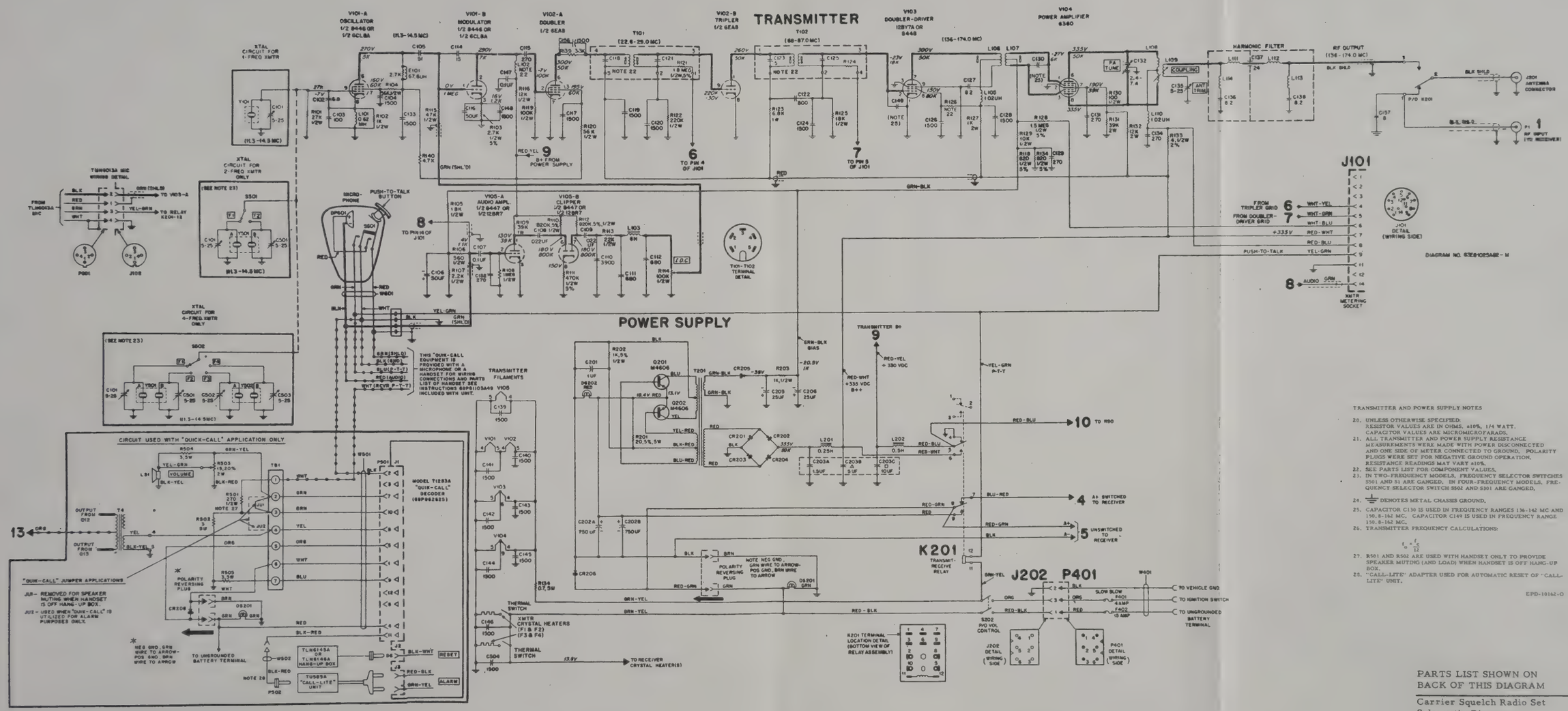
   136-150.8 MC $f_o = \frac{f_c + 5.5\ MC}{4}$

   150.8-174 MC $f_o = \frac{f_c - 5.5\ MC}{4}$
8. C67, R93 USED IN "QUIK-CALL" MODELS ONLY.
9. NOT USED IN "QUIK-CALL" MODELS

EPD-10161-O

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON FRONT OF THIS DIAGRAM

Carrier Squelch Radio Set
Schematic Diagram
Motorola No. 63E81025A82-M
(Sheet 1 of 2)
5/2/67-GM


TRANSMITTER
POWER SUPPLY
V101-A OSCILLATOR 1/2 8446 OR 1/2 6CL8A
V101-B MODULATOR 1/2 8446 OR 1/2 6CL8A
V102-A DOUBLER 1/2 6EA8
V102-B TRIPLER 1/2 6EA8
V103 DOUBLER-DRIVER 12BY7A OR 8448
V104 POWER AMPLIFIER 6360
V105-A AUDIO AMPL. 1/2 8447 OR 1/2 12BR7
V105-B CLIPPER 1/2 8447 OR 1/2 12BR7
T101 (22.6-29.0 MC)
T102 (68-87.0 MC)
(136-174.0 MC)
XTAL CIRCUIT FOR 1-FREQ XMTR
XTAL CIRCUIT FOR 2-FREQ XMTR ONLY
XTAL CIRCUIT FOR 4-FREQ XMTR ONLY
MICRO-PHONE
PUSH-TO-TALK BUTTON
TLN6013A MIC WIRING DETAIL
TLN6143A OR TLN6146A HANG-UP BOX
TU1583A "CALL-LITE" UNIT
THIS "QUIK-CALL" EQUIPMENT IS PROVIDED WITH A MICROPHONE OR A HANDSET FOR WIRING CONNECTIONS AND PARTS LIST OF HANDSET SEE INSTRUCTIONS 68P81103A49 INCLUDED WITH UNIT.
TRANSMITTER FILAMENTS
THERMAL SWITCH
XMTR CRYSTAL HEATERS (F1 & F2) (F3 & F4)
TO RECEIVER CRYSTAL HEATER(S)
"QUIK-CALL" JUMPER APPLICATIONS
J U1 - REMOVED FOR SPEAKER MUTING WHEN HANDSET IS OFF HANG-UP BOX.
J U2 - USED WHEN "QUIK-CALL" IS UTILIZED FOR ALARM PURPOSES ONLY.
MODEL T1283A "QUIK-CALL" DECODER (68P81282B25)
TO VEHICLE GND
TO IGNITION SWITCH
TO UNGROUNDED BATTERY TERMINAL
K201 TRANSMIT-RECEIVE RELAY
K201 TERMINAL LOCATION DETAIL (BOTTOM VIEW OF RELAY ASSEMBLY)
S202 PVO VOL CONTROL
J101
J101 DETAIL (WIRING SIDE)
J202 DETAIL (WIRING SIDE)
P401 DETAIL (WIRING SIDE)
HARMONIC FILTER
RF OUTPUT (136-174.0 MC)
ANTENNA CONNECTOR
RF INPUT (TO RECEIVER)
XMTR METERING SOCKET
FROM TRIPLER GRID
FROM DOUBLER-DRIVER GRID
+335 V
PUSH-TO-TALK
AUDIO
A+ SWITCHED TO RECEIVER
UNSWITCHED TO RECEIVER
TO PIN 4 OF J101
TO PIN 5 OF J101
TO PIN 16 OF J101
TO PIN 9 OF J101
TO R90
DIAGRAM NO. 63E81025A82-M

TRANSMITTER AND POWER SUPPLY NOTES

20. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 WATT. CAPACITOR VALUES ARE MICROMICROFARADS.
21. ALL TRANSMITTER AND POWER SUPPLY RESISTANCE MEASUREMENTS WERE MADE WITH POWER DISCONNECTED AND ONE SIDE OF METER CONNECTED TO GROUND. POLARITY PLUGS WERE SET FOR NEGATIVE GROUND OPERATION. RESISTANCE READINGS MAY VARY ±10%.
22. SEE PARTS LIST FOR COMPONENT VALUES.
23. IN TWO-FREQUENCY MODELS, FREQUENCY SELECTOR SWITCHES S501 AND S1 ARE GANGED. IN FOUR-FREQUENCY MODELS, FREQUENCY SELECTOR SWITCH S502 AND S301 ARE GANGED.
24. ⏚ DENOTES METAL CHASSIS GROUND.
25. CAPACITOR C130 IS USED IN FREQUENCY RANGES 136-142 MC AND 150.8-162 MC. CAPACITOR C149 IS USED IN FREQUENCY RANGE 150.8-162 MC.
26. TRANSMITTER FREQUENCY CALCULATIONS:

$$f_o = \frac{f_c}{12}$$

27. R501 AND R502 ARE USED WITH HANDSET ONLY TO PROVIDE SPEAKER MUTING (AND LOAD) WHEN HANDSET IS OFF HANG-UP BOX.
28. "CALL-LITE" ADAPTER USED FOR AUTOMATIC RESET OF "CALL-LITE" UNIT.

EPD-10162-O

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Carrier Squelch Radio Set
Schematic Diagram
Motorola No. 63E81025A82-M
(Sheet 2 of 2)
5/2/67-GM

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
N6019A Microphone (MK601)		EPD-11882-O
P601	59C82933C01 or59D82817C01	CARTRIDGE, microphone: incl. pre-amplifier
601	40C82326G01	SWITCH, push dpst; does not incl 38A852699 BUTTON, push
601	1V80711A94	CORD, microphone: incl 30K852742 CORD, coiled; tinsel; 4 cond. 41A852707 SPRING, strain relief 29A847033 LUG, term.: 4 req'd 29A847034 LUG, term.: 4 req'd
NON-REFERENCED ITEMS		
	1V80720A94	HOUSING ASSY. (rear)
	15D82701B01	HOUSING (front)
	42A852710	STRAP
	32A82703B01	GASKET, microphone
	42B82702B01	RETAINER, cartridge
	1V865398	MICROPHONE MOUNTING KIT: incl 64A85596 PLATE, support 3S122830 SCREW, tapping: #8 x 1/2"; 2 req'd

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
N6100A Cable Kit		EPD-11883-A
401	65K834464	FUSE, cartridge: 4 amp; 125 v; slow-blow type
402	65S4165	15 amp; 32 v
401		CONNECTOR, plug: (p/o 30C82545D01) incl in W401
401	1V80720A54	CABLE ASSEMBLY, power incl. F401, 402 and the following items 1V80720A55 CABLE ASSY; incl; 30C82545D01 CABLE AND PLUG ASSY.; (P401) 42A82884A01 CLIP, fuseholder 2 req'd 14A82883A01 CAP, fuseholder 2 req'd 1V80720A56 LEAD AND LUG ASSY: incl 30K868999 LEAD, electrical: #14 ga. str. BLK; 8 ft req'd 29B82607B02 LUG, ring tongue; for 5/16" stud 1V80717A08 LEAD AND FUSEHOLDER ASSY: incl 10M343 WIRE, electrical: #18 ga. str. ORG; 50" req'd 42A82884A01 CLIP, fuseholder 14A82882A01 BODY, fuseholder 41A82885A01 SPRING, fuse-holder: 29K824456 LUG; ring tongue: for #10 stud 1V80711A78 LEAD AND FUSEHOLDER ASSY: incl 30B82724C01 LEAD, electrical #14 ga. str.; RED 79" req'd 42A82884A01 CLIP, fuseholder 14A82882A01 BODY; fuseholder 41A82885A01 SPRING, fuse-holder; 29B82607B03 LUG, ring tongue; for 3/8" stud 43K867963 SLEEVE, connector

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TLN6473A Adapter Kit		EPD-11884-A
	28A48250	ADAPTER, right angle; single contact; coaxial type

PARTS LIST UNIQUE TO UNITS WITH "QUIK-CALL" APPLICATIONS EPD-12347-O

R503	18D82034E01	RESISTOR: var.; 15 ±20%; 2 w; linear; incl dpst switch
R504	17C82177B01	fixed: 3 ±10%; 5 w
TB1		BOARD, terminal: (for reference only)

TLN6580A Handset Adapter Kit EPD-12348-O

R501	6S6432	RESISTOR, fixed: 270 ±10%; 1/2 w
R502	17C82177B01	3 ±10%; 5 w

TLN6537A Call Light Adapter Kit EPD-12349-A

R502	29K847963	CONNECTOR, plug: male; single contact; pin type coded "56"
W502		LEAD, electrical: incl P502 and the fol. items: 10M127354 WIRE, electrical No. 18 ga. str. coded BLK-RED; 50" length req'd 29A82109E03 LUG, contact; male; slide connector 14A82108E01 INSULATOR, lug

TKN6201A Cable Kit EPD-12350-O

P501	9A880725	CONNECTOR, plug: female; 12 contact
W501		CABLE ASSY, special purpose: incl P501 and the fol. items 30C82015E01 CABLE, special purpose: 8 cond: plastic covered; 6 cond. No. 22 ga; str. 2 cond. No. 18 ga. str. (BLK, YEL); 60" length req'd 37K50638 SLEEVE, neoprene 37K800655 SLEEVE, neoprene 5 req'd 11M9584 TUBING, ins. No. 6: BLK; 10" length req'd 10M127354 WIRE, electrical: No. 18 ga. str. coded BLK-RED 29A859118 LUG contact; female; slide connector 14A859051 INSULATOR, lug

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TLN6530A Miscellaneous Parts Kit		EPD-12351-O
R505	17C82177B01	RESISTOR, fixed: 3 ±10%; 5 w
For parts list of TLN6145A Handset Hang-Up Box, TLN6146A Microphone Hang-Up Box and TU585A "Call-Lite" Unit, see Installation and Operation Instruction included with above kits.		

NOTES:

I Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

II When ordering crystal units, specify carrier frequency, crystal frequency and crystal type number.

REVISI

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHA
A	TLD6372B-1	R97	ADDED 5.
B	TLD6371A		ADDED 1 MODEL
C	TUD1120BB-1 TUD1121BB-1	R98	ADDED 4.
D	TLN6723B-1	Q6	WAS 48R8 TYPE M9
E	TUD1120BB-2	V102	WAS 97R1 TYPE 844 95T270A0
		V103	WAS 95R1 8448 or 95 12BY7A
		C155	WAS 23C8 5 uf
F	TLD6322A-3 TLD6323A-2	R99	ADDED 4.
G	TLN6957A-1		REVISED BOARD P
H	TKN6100A-1	F402	WAS 65R1
J	TLD6321A-2 TLD6322A-4 TLD6323A-3	Q1	WAS 48R8 M9108
		C1	WAS 21K8 uuf
		R2	WAS 6K12
K	TUD1120BB-3 TUD1121BB-2	C156	ADDED 15
		R139	ADDED 3.
		R140	ADDED 4.
		R120	WAS 6S64
		R109	WAS 6R64
		R110, 112	WERE 6S5
		R123	WAS 6S56
		R127	WAS 6R63
		R116	WAS 6R20
		R132	WAS 6R62
		C203	WAS 23D8 400 V
L	TLD6371A-1 TLD6372B-2 TLD6723B-2	C9, 10, 11, 40, 43, 56, 63, 83, 85, 86	WERE 21D .01 uf; 100
		C21, 30, 46, 49	WERE 21D .02 uf; 100
M	TLD6371A-2 TLD6372B-3	Y2	WAS G04 5
N	TLD6321A-3 TLD6322A-5 TLD6323A-4	C1	WAS 21K85 20 uuf
		C4M	WAS 21R1 5.6 uuf
		L6L	WAS 24V80 CODED CB
		L6M	WAS 24V80 CODED CB
		L6H	WAS 24V80 CODED CC
		Q1	WAS 48R86 M9405
		R2	WAS 6K129
		R99	REMOVED 4.7K IN PA WITH C4
		C160L, M	ADDED 1.
		C160H	ADDED 1.
P	TUD1120BB-4 TUD1121BB-3	C157	ADDED 8 u
R	TLD6371A-3 TLD6372B-4	Y2	WAS G08, 5

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R69	6S6393	1.2K; 1/2 w
R70	6R400057	270 ±5%; 1/2 w
R71	6R6040	680; 1/2 w
R72	6S5581	3.3K; 1/2 w
R73	6S6229	1K; 1/2 w
R74	6S400804	390 ±5%; 1/2 w
R75	6S131657	390 ±5%; 1 w
R76	6S400076	39K ±5%; 1/2 w
R78	6S5621	10; 1/2 w
R79	17C82350A05	0.16; 1 w
R81	18D82515B04	var; 2K ±30%; 0.5 w
R82	6R128685	22K
R84	6K129236	15K ±5%
R86	6K129984	680 ±5%
R89, 96	6R128688	2.7K
R90	6S128902	47K
R91	6R129226	100K
R95	6R129755	10
R98	6R6080	4.7K; 1/2 w
		THERMISTOR:
RT1	6C82769A01	10 ohms ±10% @ 25° C
		SWITCH, rotary:
S1	40C82839C02	single pole; 2 position; non-shorting
		SWITCH, slide:
S2	40B82073D01	dpdt
		TRANSFORMER, AF:
T1	25B82454G01	pri: (YEL dot); res 2300 ±10% sec: res 147 ±10%
T2	25C82431C04	pri: terminals coded 1, 2; res 65 ohms sec: terminals coded 3, 5; w/center tap terminal coded 4; total res. 4.2 ohms
T3	25C82811C04	pri: BLU, BRN w/center tap terminal coded 2; total res 0.79 ohms sec. No. 1: terminals coded 5, 4; res 0.23 ohms sec. No. 2: terminals coded 6, 7; res. 3 ohms
		TRANSFORMER, IF: 5.5 mc;
T4	24V80902A24	(L10 & L11); incl C23, C24, C25, R18 and (2) 1A82354B11 CORE, tuning
T5	24V80902A25	(L12 & L13); incl C26, C27, C28, and (2) 1A82354B11 CORE, tuning
		TRANSFORMER, discriminator: 455 kc;
T6	24V80902A28	(L14 & L15); incl (2) 1K868663 CORE, tuning
		SOCKET, transistor
XQ14, 15	9D82673A01	2 contact
		SOCKET, crystal:
XY1, 301	9C855941	6 contact
		CRYSTAL UNIT, quartz (NOTE II)
*Y1	ZMM-50A	incl 1 crystal (150.8-174 mc); used in 1-freq. receivers only
	or ZMM-66A	incl. 1 crystal (136-150.8 mc); used in 1-freq. receivers only
Y2	G04	5.955 mc
*Y301	ZMM-50-50A	incl 2 crystals (150.8-174 mc); used in 2-freq. receivers
		*NOTE: includes thermostat and 12 volt heater
		FILTER, IF: bandpass:
Z1	TFN6015AS	±5kc

TRANSMITTER

EPD-12345-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf; unl stated
C101, 501, 502, 503	20K859643	var; 5-25; NP0
C102	21K865469	6.8 ±.25; 500 v; N330
C103	21K850118	100 ±5%; 500 v
C104, 117, 119, 120, 124, 126, 128, 133, 140, 141, 142, 143, 144, 145, 146, 148, 156, 504	21B800801	1500 GMV; +100% max; 500 v
C105	21K840711	51 ±5%; 500 v
C106, 116	23C82601A05	50 uf +150-10%; 25 v
C107	21C82372C03	0.1 uf +80-20%; 25 v
C108	8K852472	.022 uf ±10%; 200 v
C109	8K863322	.022 uf ±10%; 400 v
C110	21K837996	3900 ±10%; 500 v
C111, 112	21K865452	680 ±10%; 500 v
C114	21K840846	15 ±5%; 500 v; NP0
C115, 129, 131, 134	21C82187B04	270 ±10%; 500 v
C118, 121	21K847874	12 ±5% (150.8-174 mc)
	or21K848525	15 ±5%; 500 v (136-150.8 mc)
C122	21K847070	800 ±10%; 600 v
C123	21D82355B01	5 ±5%; 500 v; N470 (150.8-174 mc)
	or21K851681	8 ±0.5; 500 v; N470 (136-150.8 mc)
C125	21K832520	3 ±25%; 500 v; N470 (150.8-174 mc)
	or21K851681	8 ±0.5; 500 v; N470 (136-150.8 mc)
C127	21D82355B12	8.2 ±5%; 500 v; N470
C130	21K857336	2 ±.25; 500 v; NP0 (136-142 mc & 150.8-162 mc)
C132	19B847063	var; 7.4-2.4
C135	20C82109C02	var; 5-25; NP0
C136, 138	21K865357	8.2 ±5%; 500 v; NP0
C137	21K857335	feed-thru; 24 ±5%; 500 v; N080
C139	8D82905G07	0.1 uf ±10%; 25 v
C147	8K858371	0.1 uf ±10%; 400 v
C149	21K868935	3 ±.25; 2000 v; NP0 (150.8-162 mc)
C152	21K847085	270 ±10%; 300 v
C154	21K847070	800 ±10%; 600 v
C157	21K847743	8 ±.5 uuf; 500 v; NP0
E101	24A838456	SUPPRESSOR: parasitic
J101	9C857358	CONNECTOR, receptacle: female; 12 contact
J102	9K830418	female; 4 contact
L101	24K864737	COIL, RF: choke; 62 mh
L102	24D82480B02	choke; 16 uh (150.8-174 mc)
	or24C82000E06	choke; 33 uh; sleeved (136-150.8 mc)
L103	25C82697C01	choke; splatter; 6 h
L105, 110	24V80900A86	choke; 1.02 uh; ins.
L106	24A82468D01	plate; doubler-driver (150.8-174 mc)
	or24A82468D02	plate; douber-driver (136-150.8 mc)
L107	24A82467D01	grid; PA (150.8-174 mc)
	or24A82467D02	grid; PA (136-150.8 mc)
L108	24V80900A88	plate; tank; incl ref part L110 (150.8-174 mc)
	or24V80901A64	plate; tank; incl ref part L110 (136-150.8 mc)
L109	1V80716A26	output; coupling loop (150.8-174 mc)
	or1V80721A68	output; coupling loop (136-150.8 mc)
L111, 112	24A82749C01	harmonic; 2 turns
L113, 114	24A82748C01	harmonic; 1 turn
R101	6S6434	RESISTOR, fixed: ±10%; 1/2 w; unl stated 27K
R102	6S6229	1K
R103	6R5662	2.7K; ±5%
R104, 120	6S6378	56K
R105	6R2089	1.8K
R106	6R6291	560
R107	6S6069	2.2K
R108	6R6046	1 megohm
R109	6R5588	39K; 1 w
R110, 112	6S5773	820K ±5%
R111	6S5795	470K ±5%
R113	6S6397	22K
R114	18K855906	var; 100K; incl mtg hdwe
R115	6S6048	47K
R116	6R6394	12K
R118, 134	6R119172	820 ±5%
R119	6S6031	100K
R121	6R401017	1.8 megohm ±5%
R122	6S6407	220K
R123	6S5691	6.8K; 1 w
R124	6R5587	1 megohm ±5% (150.8-174 mc)
	or6R5779	1.2 meg ±5% (136-150.8 mc)
R125	6S5591	18K
R126	6R6400	33K; 1 w (150.8-174 mc)
	or6R6402	56K; 1 w (136-150.8 mc)
R127, 130	6R3922	.1K; 2 w
R128	6R400228	1.5 megohm ±5%
R129	6R6320	10K
R131	6R5731	39K; 2 w
R132	6R6299	10K; 2 w
R133	6K854261	4 ±2%
R134	17C82177B12	0.7; 5 w
R139	6R5581	3.3K
R140	6R6080	4.7K
S501	40C82838C01	SWITCH, rotary: single pole; 2 positions; non-shorting
S502	40C82555D01	single pole; 4 positions; non-shorting
T101	24V80900A87	TRANSFORMER, RF: douber; BV2; incl ref parts C118, 121, R121 and (2) 1A82354B03 CORE, tuning (150.8-174 mc)
	or24V80901A65	doubler; CA8; incl ref parts C118, 121, R121 and (2) 1A82354B03 CORE, tuning (136-150.8 mc)
T102	24B82750C01	tripler; BV3; incl ref parts C123, 125, R124 and (2) 1A82354B03 CORE, tuning (150.8-174 mc)
	or24B82750C02	tripler; CA9; incl ref parts C123, 125, R124 and (2) 1A82354B03 CORE, tuning (136-150.8 mc)
V101	97R132A01	ELECTRON TUBE: 8446
	or95T324A01	6CL8A
V102	95R270A04	6EA8
V103	97R133A01	8448
	or65A82735A02	12BY7A
V104	97T126A01	6360
V105	95R351A01	8447
	or95T258A01	12BR7
Y101	ZNN-3A	CRYSTAL, quartz: (NOTE II) 1-freq operation
Y501, 502	ZNN-3-3A	2-freq & 4-freq operation
XV101, 102, 103, 104, 105	9K867359	SOCKET, tube: 9 contact
XY101, 502	9C855941	SOCKET, crystal: 6 contact

NON-REFERENCED ITEMS

	1V80711A86	RADIATOR ASSY. incl. 15D82754C01 HOUSING, radiator 26A82305A03 SHIELD, heat dissipator; 3 req'd 3A857308 SCREW, FILLISTER HEAD; 4 req'd
	64D82766C01	PANEL, front
	13B82776C01	GRILLE, speaker
	32B82775C01	GASKET; speaker grille
	61A82720C01	LENS; indicator; RED
	61A82720C02	LENS; indicator; GRN
	55A82082D01	LOCK, front panel; incl (2) 55K893872 KEY
	1B82520C02	SOCKET, "Vibrasender" resonant reed

POWER SUPPLY

EPD-12346-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf; unl stated
C201	8K859592	1 uf
C202	23D82125B07	dual sect; c/o: □750 uf +100-0%; 25 v △750 uf +100-0%; 25 v
C202A		
C202B		
C203	23D82178B06	3 section; c/o: 1.5 uf +50-10%; 450 v △5 uf +50-10%; 450 v □10 uf +50-10%; 450 v
C203A		
C203B		
C203C		
C205, 206	23C82601A08	25 uf +150-10%; 50 v
CR201, 202, 203, 204	48C82466H02	SEMICONDUCTOR DEVICE, diode (NOTE I) silicon
CR205	48C82466H01	silicon
CR206	48C82525G01	silicon
DS201, 202	65C82010C02	LAMP, incandescent: 18 volt; 0.15 amp; type 1445
J201	9C85615	CONNECTOR, receptacle: single contact; does not incl 15A483599 HOOD, connector
J202	1V80731A53	incl; 14C82544D01 BODY 29C82336A01 CONTACT; 6 req'd
K201	80C82753C05	RELAY, armature: 3 form "C"; coil res 100 ohms
L201	25C82038D01	REACTOR: 0.25 h; res 63 ohms ±20%
L202	25B82803C01	0.5 h; res 185 ohms ±10%
Q201, 202	48R134606	TRANSISTOR: (NOTE I) P-N-P; type M4606; does not incl 14K865875 INSULATOR; transistor mounting
R201	17C82177B07	RESISTOR, fixed: ±10%; 1/2 w; unl stated 20 ±5%; 5 w
R202	6R6411	1K ±5%
R203	6R6229	1K
S202		SWITCH, toggle: dpst; part of R52
T201	25D83261D01	TRANSFORMER, power: pri: YEL, BLU with BLK center tap feedback; YEL-RED, BLU-RED with BLK-RED center tap sec (h.v.): RED, RED sec (l.v.): GRN-BLK, GRN-BLK
XDS201, 202	9B82778C01	LAMPHOLDER: single cont; min. bay type incl mounting clip
XQ201, 202	9D82673A01	SOCKET, transistor: 2 contact

TMN6019A Microphone (MK601)

EPD-11882-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
DP601	59C82933C01 or59D82817C01	CARTRIDGE, microphone: incl. pre-amplifier
S601	40C82326G01	SWITCH, push dpst; does not incl 38A852699 BUTTON, push
W601	1V80711A94	CORD, microphone: incl 30K852742 CORD, coiled; tinsel; 4 cond. 41A852707 SPRING, strain relief 29A847034 LUG, term.: 4 req'd 29A847033 LUG, term.: 4 req'd

NON-REFERENCED ITEMS

	1V80720A94	HOUSING ASSY. (rear)
	15D82701B01	HOUSING (front)
	42A852710	STRAP
	32A82703B01	GASKET, microphone
	42B82702B01	RETAINER, cartridge
	1V865398	MICROPHONE MOUNTING KIT: incl 64A85596 PLATE, support 3S122830 SCREW, tapping: #8 x 1/2"; 2 req'd

TKN6100A Cable Kit

EPD-11883-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F401	65K834464	FUSE, cartridge: 4 amp; 125 v; slow-blow type
F402	65S4165	15 amp; 32 v
P401		CONNECTOR, plug: (p/o 30C82545D01) incl in W401
W401	1V80720A54	CABLE ASSEMBLY, power incl. F401, 402 and the following items 1V80720A55 CABLE ASSY; incl; 30C82545D01 CABLE AND PLUG ASSY.; (P401) 42A82884A01 CLIP, fuseholder 2 req'd 14A82883A01 CAP, fuseholder 2 req'd 1V80720A56 LEAD AND LUG ASSY: incl 30K868999 LEAD, electrical: #14 ga. str. BLK; 8 ft req'd 29B82607B02 LUG, ring tongue; for 5/16" stud 1V80717A08 LEAD AND FUSEHOLDER ASSY: incl 10M343 WIRE, electrical: #18 ga. str. ORG; 50" req'd 42A82884A01 CLIP, fuseholder 14A82882A01 BODY, fuseholder 41A82885A01 SPRING, fuseholder: 29K824456 LUG; ring tongue: for #10 stud 1V80711A78 LEAD AND FUSEHOLDER ASSY: incl 30B82724C01 LEAD, electrical #14 ga. str.; RED 79" req'd 42A82884A01 CLIP, fuseholder 14A82882A01 BODY; fuseholder 41A82885A01 SPRING, fuseholder; 29B82607B03 LUG, ring tongue; for 3/8" stud 43K867963 SLEEVE, connector

TLN6473A Adapter Kit

EPD-11884-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	28A48250	ADAPTER, right angle; single contact; coaxial type

PARTS LIST UNIQUE TO UNITS WITH "QUIK-CALL" APPLICATIONS

EPD-12347-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R503	18D82034E01	RESISTOR: var.; 15 ±20%; 2 w; linear; incl dpst switch
R504	17C82177B01	fixed: 3 ±10%; 5 w
TB1		BOARD, terminal: (for reference only)

TLN6580A Handset Adapter Kit

EPD-12348-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R501	6S6432	RESISTOR, fixed: 270 ±10%; 1/2 w
R502	17C82177B01	3 ±10%; 5 w

TLN6537A Call Light Adapter Kit

EPD-12349-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R502	29K847963	CONNECTOR, plug: male; single contact; pin type coded "56"
W502		LEAD, electrical: incl P502 and the fol. items: 10M127354 WIRE, electrical No. 18 ga. str. coded BLK-RED; 50" length req'd 29A82109E01 LUG, contact; male; slide connector 14A82108E01 INSULATOR, lug

TKN6201A Cable Kit

EPD-12350-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
P501	9A880725	CONNECTOR, plug: female; 12 contact
W501		CABLE ASSY, special purpose: incl P501 and the fol. items 30C82015E01 CABLE, special purpose: 8 cond: plastic covered; 6 cond. No. 22 ga; str. 2 cond. No. 18 ga. str. (BLK, YEL); 60" length req'd 37K50438 SLEEVE, neoprene 37K800655 SLEEVE, neoprene 5 req'd 11M9584 TUBING, ins. No. 6: BLK; 10" length req'd 10M127354 WIRE, electrical: No. 18 ga. str. coded BLK-RED 29A859118 LUG contact; female; slide connector 14A859051 INSULATOR, lug

TLN6530A Miscellaneous Parts Kit

EPD-12351-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R505	17C82177B01	RESISTOR, fixed: 3 ±10%; 5 w

For parts list of TLN6145A Handset Hang-Up Box, TLN6146A Microphone Hang-Up Box and TU585A "Call-Lite" Unit, see Installation and Operation Instruction included with above kits.

NOTES:

I Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

II When ordering crystal units, specify carrier frequency, crystal frequency and crystal type number.

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
A	TLD6372B-1	R97	ADDED 5.6K	T1 PRIMARY	EPD-11292-A
B	TLD6371A		ADDED 136-150.8 MC MODEL	PARTS LIST & SCHEM. DIAG.	FRONT END BOARD EPD-11292-B
C	TUD1120BB-1 TUD1121BB-1	R98	ADDED 4.7K	T2 PRIMARY	AUDIO OUTPUT BD. EPD-11308-A
D	TLN6723B-1	Q6	WAS 48R869003, TYPE M9003	455 KC IF BD. AMPL-1	455 KC IF BD. EPD-11295-A
E	TUD1120BB-2	V102	WAS 97R131A01, TYPE 8445; OR 95T270A04	DOUBLER, TRIPLER	NONE
		V103	WAS 95R133A01, 8448 or 95T164A02, 12BY7A	PARTS LIST	
		C155	WAS 23C82601A11, 5 uf	UPPER RIGHT OF Q704	
F	TLD6322A-3 TLD6323A-2	R99	ADDED 4.7K	Q1 COLLECTOR	NONE
G	TLN6957A-1		REVISED CIRCUIT BOARD PLATING		TONE GEN. EPD-11343-A
H	TKN6100A-1	F402	WAS 65R10266 10 AMP	P401-1	NONE
J	TLD6321A-2 TLD6322A-4 TLD6323A-3	Q1	WAS 48R869108, M9108	RECEIVER RF AMP	NONE
		C1	WAS 21K840046, 100 uuf	Q1 BASE	
		R2	WAS 6K128904, 18K		
K	TUD1120BB-3 TUD1121BB-2	C156	ADDED 1500 uuf	V102A-6	NONE
		R139	ADDED 3.3K		
		R140	ADDED 4.7K	V101A-OSC.	
		R120	WAS 6S6487, 39K	V102A-6	
		R109	WAS 6R6400, 33K	V105A-1	
		R110, 112	WERE 6S5775, 680K	V105B-6, 7	
		R123	WAS 6S5618, 3.9K	T102	
		R127	WAS 6R6326, 100	V103 GRID	
		R116	WAS 6R2089, 1.8K	V101B PLATE CIRCUIT	
		R132	WAS 6R6299, 10K	V104 GRID CIRCUIT	
		C203	WAS 23D82178B03, 400 V	PARTS LIST	
L	TLD6371A-1 TLD6372B-2 TLD6723B-2	C9, 10, 11, 40, 43, 56, 63, 83, 85, 86	WERE 21D82428B02, .01 uf; 100 V	PARTS LIST	NONE
		C21, 30, 46, 49	WERE 21D82824B18, .02 uf; 100 V		
M	TLD6371A-2 TLD6372B-3	Y2	WAS G04 5.955 MC	2ND OSCILLATOR	FRONT END BOARD EPD-11292-C
N	TLD6321A-3 TLD6322A-5 TLD6323A-4	C1	WAS 21K859696 20 uuf	Q1 BASE	NONE
		C4M	WAS 21R122173 5.6 uuf	PARTS LIST	
		L6L	WAS 24V80901A66 CODED CB1		
		L6M	WAS 24V80901A67 CODED CB2		
		L6H	WAS 24V80901A73 CODED CC3		
		Q1	WAS 48R869405, M9405	RF AMPL	
		R2	WAS 6K129433 5.6K	Q1 BASE	
		R99	REMOVED 6S127804 4.7K IN PARALLEL WITH C4		
		C160L, M	ADDED 1.5 uuf		
		C160H	ADDED 1.2 uuf		
P	TUD1120BB-4 TUD1121BB-3	C157	ADDED 8 uuf	K201-1	NONE
R	TLD6371A-3 TLD6372B-4	Y2	WAS G08, 5.04 MC	2ND OSC.	FRONT END BD EPD-11292-D

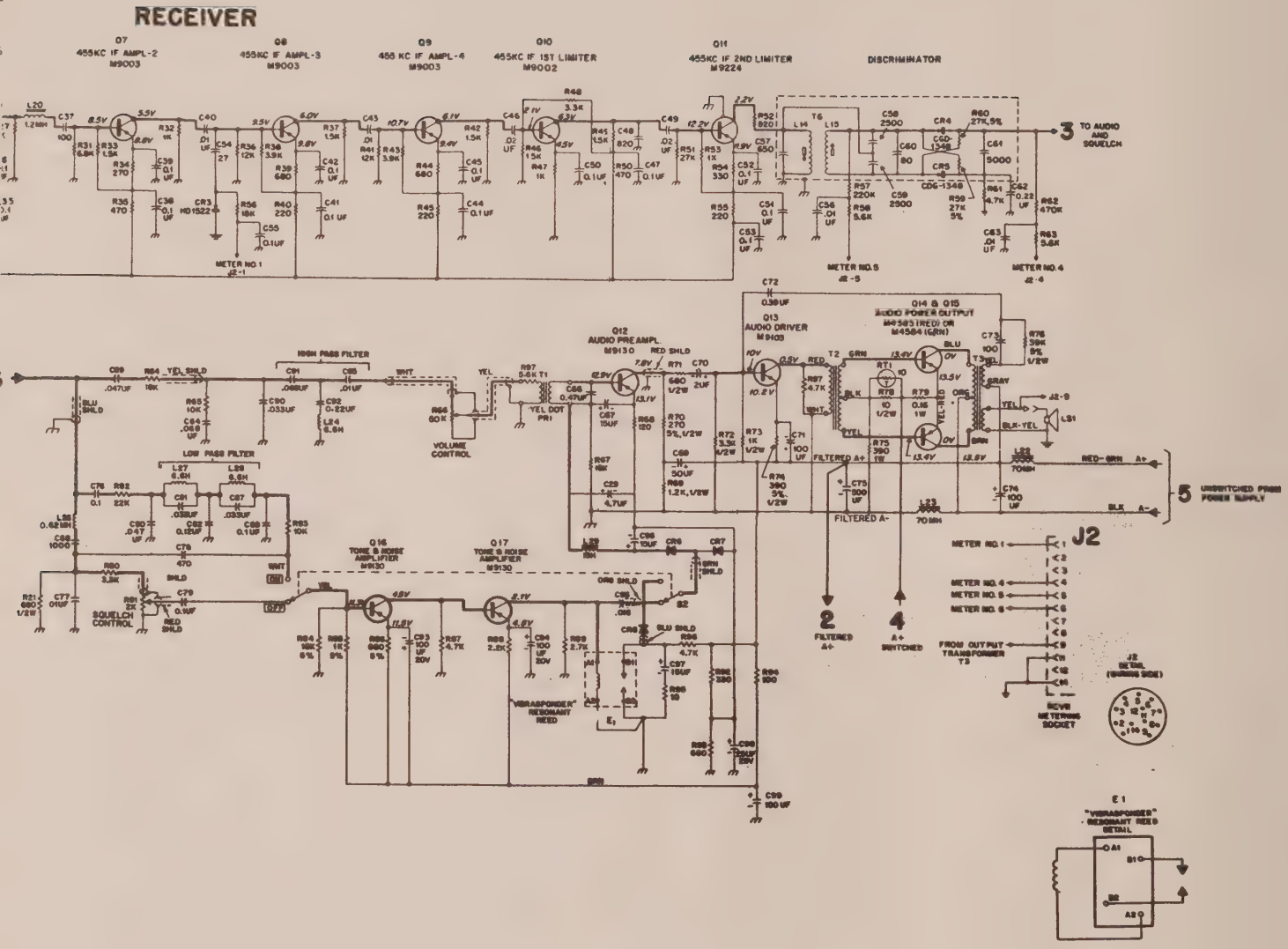
PARTS LIST

LEGEND
L = 136-150.8 MC
M = 150.8-162 MC
H = 162-174 MC

RECEIVER EPD-12337-G

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uf; ±10% 500 v; unl stated
C1	21K840046	100 uuf
C2, 3	21B861219	1000 uuf GMV
C4L, 16	21R410063	10 uuf ±0.5 uuf; NP0
C4M	21K864746	6 uuf; ±5%; N150
C4H	21K857337	7.5 uuf ±0.5 uuf; NP0
C6, 7, 28, 33	21C82187B11	1500 uuf; 100 v
C8	21K840846	15 uuf ±5%; NP0
C9, 10, 11, 40, 43, 56, 63, 83, 85, 86	21D82428B59	.01 +80-20%; 200 v
C12	8D82905G07	0.1 ±10%; 25 v
C13, 301	20K867490	var; 8-50 uuf; N750
C14	21K865942	18 uuf ±5%; N470
C15, 37	21K831125	100 uuf; 300 v
C17L	21D82355B28	13 uuf ±5%; N470
C17M, 17H	21K864739	12 uuf ±5%; N470
C18	21K830201	0.3 uuf ±5%
C19L	21D859696	20 uuf ±5%; N470
C19M, 19H	21K867144	18 uuf ±5%; N750
C20	21D82355B15	24 uuf ±5%; N750
C21, 30, 46, 49	21D82428B26	.02 +80-20%; 200 v
C22	21D82428B09	.0047; 100 v
C23, 24, 26	21K859939	110 uuf ±5%
C25, 160H	21C82450B08	1.2 uuf ±5%
C27	21K859941	130 uuf ±5%
C29	23K865137	4.7 ±20%; 25 v
C31	21K848978	190 uuf ±3%
C32	21K849338	40 uuf; NP0
C34, 35, 36, 38, 39, 41, 42, 44, 45, 47, 50, 51, 52, 53, 55, 76, 88	8D83293B01	0.1; 50 v
C48	21C837745	820 uuf
C54	21K410089	27 uuf
C57	21K848236	650 uuf ±5%; 300 v
C58, 59	21K859773	2500 uuf ±5%
C60	21D82133G28	80 uuf; N1500
C61	21D82428B15	.005
C62, 92	8D83293B02	0.22; 50 v
C64	8D82905G04	.068; 25 v
C65, 77	8D83293B05	.01; 50 v
C66	8D83293B04	0.47; 50 v
C67, 96	23K865136	15 ±20%; 25 v
C68	21C82187B20	1000; 100 v
C69	23D82601A05	50 +150-10%; 25 v
C70	23D82601A20	2 +150-10%; 25 v
C71, 93	23D82601A12	100 +150-10%; 6 v
C72	8D82905G13	0.39; 50 v
C73	21K840046	100 uuf
C74	23D82601A09	100 +150-10%; 25 v
C75	23D82394A06	500 +150-10%; 25 v
C78	21C82187B07	470 uuf
C79	8D82905G24	0.1; 100 v
C80, 91	8D82905G03	.047; 25 v
C81, 87, 90	8D82905G08	.033; 25 v
C82	8D82905G09	0.12; 25 v
C84	21C82187B16	3000 uuf; 100 v
C88	8K864428	0.1; 100 v
C89	8D82905G02	.022; 25 v
C94, 99, 151	23D82601A25	100 +150-10%; 20 v
C95	8D82905G21	.018; 100 v
C97	23K865136	15 ±20%; 25 v
C98	23D83210A01	25 +150-10%; 25 v
C160L, M	21D82450B13	1.5 uuf; ±5%
		SEMICONDUCTOR DEVICE, diode: (NOTE I)
CR1	48C82617C01	silicon
	or48C82617C03	silicon
CR2	48C82363E01	silicon
CR3	48C82178A04	germanium
CR4, 5	48C82139G01	germanium
CR6, 7, 8	48K855216	germanium
		CONNECTOR, receptacle:
J1	9C87120	female; coaxial; phono type
J2	9C82748G01	female; 12 contact
		COIL, RF; unl stated
L1L	24B82890D02	coded CB4
L1M	24B82890D04	coded CB6
L1H	24B82890D06	coded CB8
L2L, 3L, 4L	24B82890D01	coded CB3
L2M, 3M, 4M	24B82890D03	coded CB5
L2H, 3H, 4H	24B82890D05	coded CB7
L5L	24B82890D07	coded CB9
L5M	24B82890D08	coded CC1
L5H	24B82890D09	coded CC2
L6L	24V80906A20	coded C01: incl. C4L, C6 and 76B82451B03 CORE, tuning
L6M	24V80906A21	coded C02; incl. C4M, C6
L6H	24V80906A19	coded CP9; incl. C4H, C6
L7	24V80902A29	incl. 1A82354B14 CORE
L8L	24V80902A92	incl. C17L, CR2, 1A82354B13 CORE
L8M, 8H	24V80902A33	incl. C17, CR2 and 1A82354B13 CORE
L9L	24V80902A93	incl. C19L, C20, 1A82354B13 CORE
L9M, 9H	24V80902A34	incl. C19, C20 and 1A82354B13 CORE
L17, 301	24D82135G04	choke; 2.6 uh
	or24B82835G03	choke; 2.6 uh
L18, 302	24B82835G04	choke; 1.5 uh
	or24D82135G05	choke; 1.5 uh
L19, 21, 26	24D82135G01	0.62 mh
L20	24C82835G18	choke; 1.2 mh
L22, 23	25B82878A03	choke; 70 mh
L24, 27, 28	25C82024D02	AF: choke; 6.5 h; res 1650 ±10%
L25	24C82835G16	choke; 5.7 uh
L29	25C82448C01	AF: choke; 15 h
		LOUDSPEAKER, permanent magnet:
LS1	50D82774C01	3" x 5"; 3.2 ohms impedance
		CONNECTOR, plug:
P1	28A474006	male; coaxial; phono type
		TRANSISTOR: (NOTE I)
Q1	48R869223	P-N-P; M9223
Q2	48R869109	P-N-P; M9109
Q3	48R869203	P-N-P; M9203
Q4, 7, 8, 9	48R869003	P-N-P; M9003
Q5, 11	48R869204	P-N-P; M9204
Q6	48R869311	P-N-P; M9311
Q10	48R869002	N-P-N; M9002
Q12, 13, 16, 17	48R869130	P-N-P; M9130
Q14, 15	48K134584	P-N-P; M4584
		RESISTOR, fixed: ±10%; 1/4 w; unl stated
R1, 48, 80	6S129231	3.3K
R2, 56, 64, 67	6K128904	18K
R3	6K129432	820
R4	6S128686	8.2K
R5	6S129237	6.8K ±5%
R6, 97	6S129982	5.6K ±5%
R7, 88	6S128689	2.2K
R8, 16, 94	6S129753	100
R9, 92, 85	6S129805	1K ±5%
R10	6S129662	180
R11, 20, 58, 63	6S129433	5.6K
R12	6S129668	10K ±5%
R13	6S129983	8.2K ±5%
R14	6R6229	1K; 1/2 w
R15, 18, 27, 32, 47, 53	6S127802	1K
R17	6S129235	1.2K
R19, 38, 43	6S129232	3.9K
R21	6R6040	680; 1/2 w
R22	6S127807	33K
R23	6S127805	15K
R25, 61, 87	6S127804	4.7K
R26, 31	6S128687	6.8K
R29, 34	6R129752	270
R30, 35, 50	6R127801	470
R33, 37, 42, 46, 49	6R127803	1.5K
R36, 41	6R129230	12K
R39, 44, 93	6R128599	680
R40, 45, 55	6S127800	220
R51	6R127806	27K
R52	6S129818	820 ±5%
R54, 92	6R129775	330
R57	6R129147	220K
R59, 60	6R129886	27K ±5%
R62	6R129148	470K
R65, 83	6K129225	10K
R66	18C82810C03	var; 50K; ±20%; 0.33 w incl. S202
R68	6S129617	120
R69	6S6393	1.2K; 1/2 w
R70	6R400057	270 ±5%; 1/2 w
R71	6R6040	680; 1/2 w
R72	6S5581	3.3K; 1/2 w
R73	6S6229	1K; 1/2 w
R74	6S400804	390 ±5%; 1/2 w
R75	6S131657	390 ±5%; 1 w
R76	6S400076	39K ±5%; 1/2 w
R78	6S5621	10; 1/2 w
R79	17C82350A05	0.16; 1 w
R81	18D82515B04	var; 2K ±30%; 0.5 w
R82	6R128685	22K
R84	6K129236	15K ±5%
R86	6K129984	680 ±5%
R89, 96	6R128688	2.7K
R90	6S128902	47K
R91	6R129226	100K
R95	6R129755	10
R98	6R6080	4.7K; 1/2 w
		THERMISTOR:
RT1	6C82769A01	10 ohms ±10% @ 25° C
		SWITCH, rotary:
S1	40C82839C02	single pole; 2 position; non-shorting
		SWITCH, slide:
S2	40B82073D01	dpdt
		TRANSFORMER, AF:
T1	25B82454G01	pri: (YEL dot); res 2300 ±10% sec: res 147 ±10%
T2	25C82431C04	pri: terminals coded 1, 2; res 65 ohms sec: terminals coded 3, 5; w/center tap terminal coded 4; total res. 4.2 ohms
T3	25C82811C04	pri: BLU, BRN w/center tap terminal coded 2; total res 0.79 ohms sec. No. 1: terminals coded 5, 4; res 0.23 ohms sec. No. 2: terminals coded 6, 7; res. 3 ohms
		TRANSFORMER, IF: 5.5 mc;
T4	24V80902A24	(L10 & L11); incl C23, C24, C25, R18 and (2) 1A82354B11 CORE, tuning
T5	24V80902A25	(L12 & L13); incl C26, C27, C28, and (2) 1A82354B11 CORE, tuning
		TRANSFORMER, discriminator: 455 kc;
T6	24V80902A28	(L14 & L15); incl (2) 1K868663 CORE, tuning
		SOCKET, transistor
XQ14, 15	9D82673A01	2 contact
		SOCKET, crystal:
XY1, 301	9C855941	6 contact
		CRYSTAL UNIT, quartz (NOTE II)
*Y1	ZMM-50A	incl 1 crystal (150.8-174 mc); used in 1-freq. receivers only
	or ZMM-66A	incl. 1 crystal (136-150.8 mc); used in 1-freq. receivers only
Y2	G04	5.955 mc
*Y301	ZMM-50-50A	incl 2 crystals (150.8-174 mc); used in 2-freq. receivers
		*NOTE: includes thermostat and 12 volt heater
		FILTER, IF: bandpass:
Z1	TFN6015AS	±5kc

RECEIVER


Q7
455KC IF AMPL-2
M9003
Q8
455KC IF AMPL-3
M9003
Q9
455 KC IF AMPL-4
M9003
Q10
455KC IF 1ST LIMITER
M9002
Q11
455KC IF 2ND LIMITER
M9224
DISCRIMINATOR
3 TO AUDIO AND SQUELCH
METER NO.1
METER NO.5
METER NO.4
HIGH PASS FILTER
LOW PASS FILTER
VOLUME CONTROL
Q12
AUDIO PREAMPL
M9130
Q13
AUDIO DRIVER
M9103
Q14 & Q15
AUDIO POWER OUTPUT
M4585 (RED) OR
M4584 (GRN)
J2-9
L31
5 UNSWITCHED POWER SUPPLY
FILTERED A-
2 FILTERED A+
4 A+ SWITCHED
J2
METER NO.1
METER NO.4
METER NO.5
METER NO.6
FROM OUTPUT TRANSFORMER T3
RCVR METERING SOCKET
SQUELCH CONTROL
Q16
TONE & NOISE AMPLIFIER
M9130
Q17
TONE & NOISE AMPLIFIER
M9130
"VIBRAPOWER" RESONANT REED
E1
"VIBRAPOWER" RESONANT REED DETAIL

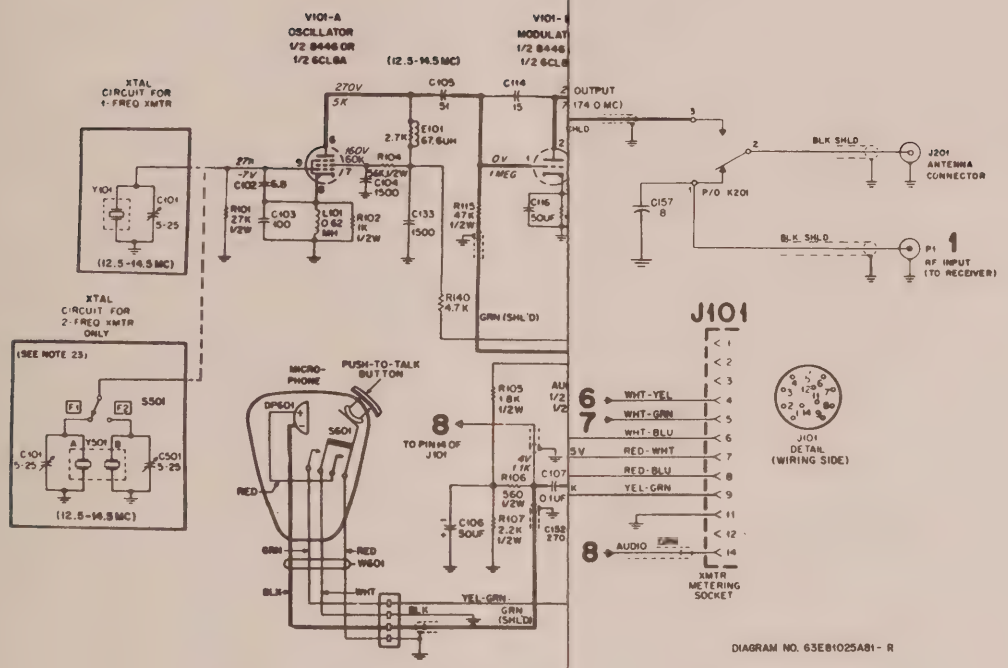
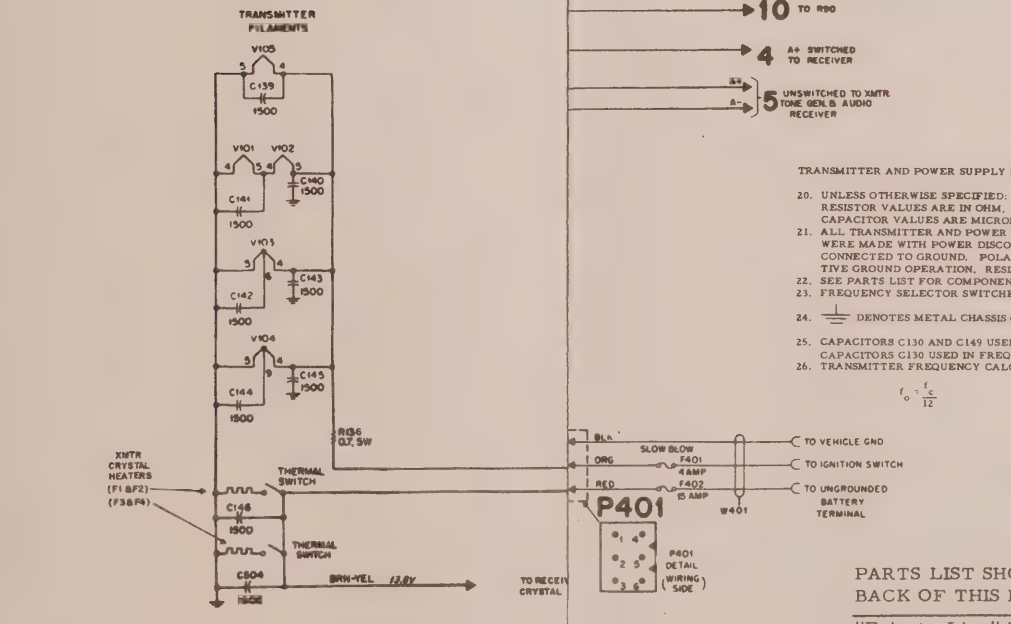


DIAGRAM NO. 63E81025A81-R



EPD-11352-A

TRANSMITTER AND POWER SUPPLY NOTES

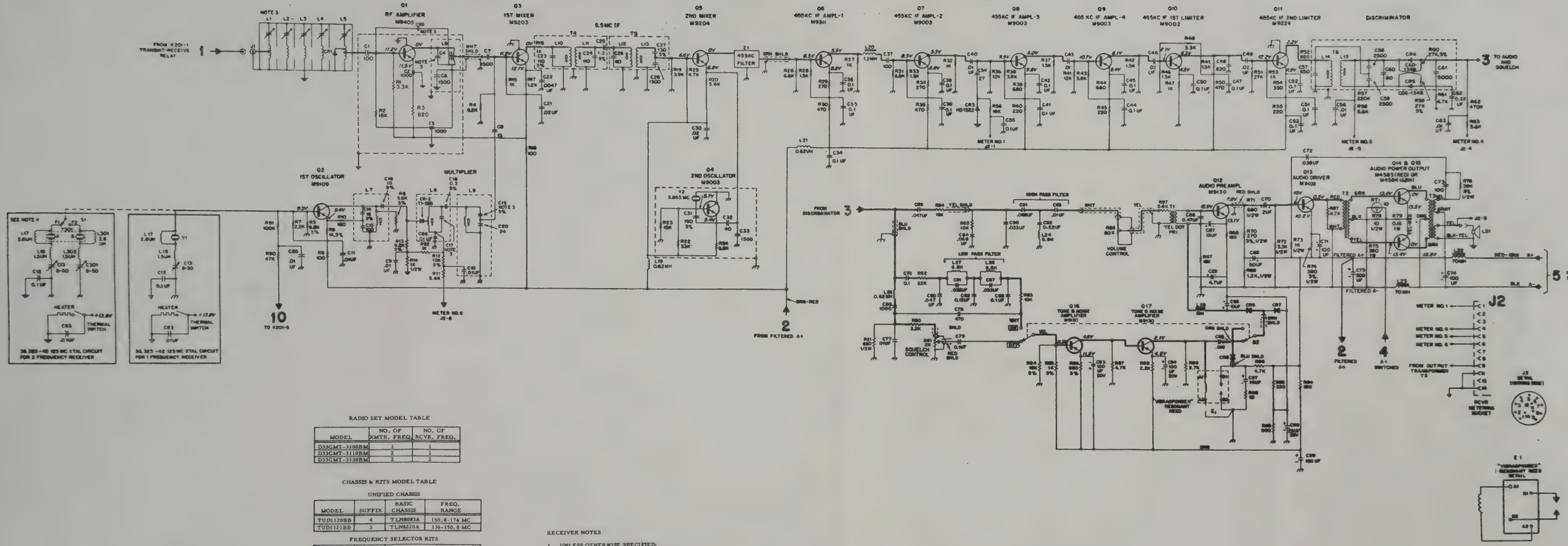
20. UNLESS OTHERWISE SPECIFIED:
RESISTOR VALUES ARE IN OHM, ±10%, 1/4 WATT.
CAPACITOR VALUES ARE MICROMICROFARADS.
21. ALL TRANSMITTER AND POWER SUPPLY RESISTANCE MEASUREMENTS WERE MADE WITH POWER DISCONNECTED AND ONE SIDE OF METER CONNECTED TO GROUND. POLARITY PLUGS WERE SET FOR NEGATIVE GROUND OPERATION. RESISTANCE READINGS MAY VARY ±10%.
22. SEE PARTS LIST FOR COMPONENT VALUES.
23. FREQUENCY SELECTOR SWITCHES S501 AND S1 ARE GANGED.
24. ⏚ DENOTES METAL CHASSIS GROUND.
25. CAPACITORS C130 AND C149 USED IN FREQUENCY RANGE 150.8-162 MC. CAPACITORS C130 USED IN FREQUENCY RANGE 136-142 MC.
26. TRANSMITTER FREQUENCY CALCULATIONS:

$$f_o = \frac{f_c}{12}$$

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

"Private-Line" Tone Squelch Radio Set
Schematic Diagram
Motorola No. 63E81025A81-R
(Sheet 2 of 2)
5/2/67-GM

RECEIVER



RADIO SET MODEL TABLE

MODEL	NO. OF XMTR. FREQ.	NO. OF RCVR. FREQ.
D33CMT-3100BM	1	1
D33CMT-3110BM	2	1
D33CMT-3130BM	2	2

CHASSIS & KITS MODEL TABLE

UNIFIED CHASSIS

MODEL	SUFFIX	BASIC CHASSIS	FREQ. RANGE
TUD1120BB	4	TLN8083A	150.8-174 MC
TUD1121BB	3	TLN8220A	136-150.8 MC

FREQUENCY SELECTOR KITS

MODEL	SUFFIX	DESCRIPTION
TLN6706A		2-FREQ. XMTR. KIT
TLN6707A		2-FREQ. XMTR. & RCVR. KIT

CABLE KIT

MODEL	SUFFIX	DESCRIPTION
TKN6100A	1	12 VDC POWER INPUT CABLE

MISCELLANEOUS KITS

MODEL	SUFFIX	DESCRIPTION
TLD6321A	3	RECEIVER RF DECK (136-150.8 MC)
TLD6322A	5	RECEIVER RF DECK (150.8-162 MC)
TLD6323A	3	RECEIVER RF DECK (162-174 MC)
TMN6019A		WIRED IN TRANSISTORIZED MICROPHONE

EPD-11306-G

RECEIVER NOTES

1. UNLESS OTHERWISE SPECIFIED: RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 WATT. CAPACITOR VALUES ARE IN MICROMICROFARADS.
2. ALL RECEIVER VOLTAGES ARE MEASURED WITH RESPECT TO RECEIVER PRINTED CIRCUIT BOARD GROUND.
3. SEE PARTS LIST FOR COMPONENT VALUES.
4. FREQUENCY SELECTOR SWITCHES S1 AND S501 ARE GANGED.
5. ⏚ DENOTES RECEIVER PRINTED CIRCUIT BOARD GROUND

   ⏚ DENOTES METAL CHASSIS GROUND.
6. WHEN SERVICING THE RADIO SET DO NOT SHORT THE RECEIVER CHASSIS TO THE MAIN CHASSIS OR VEHICLE FRAME. DOING THIS WILL BLOW THE BATTERY FUSE IN POSITIVE GROUND INSTALLATIONS.
7. RECEIVER FREQUENCY CALCULATIONS:

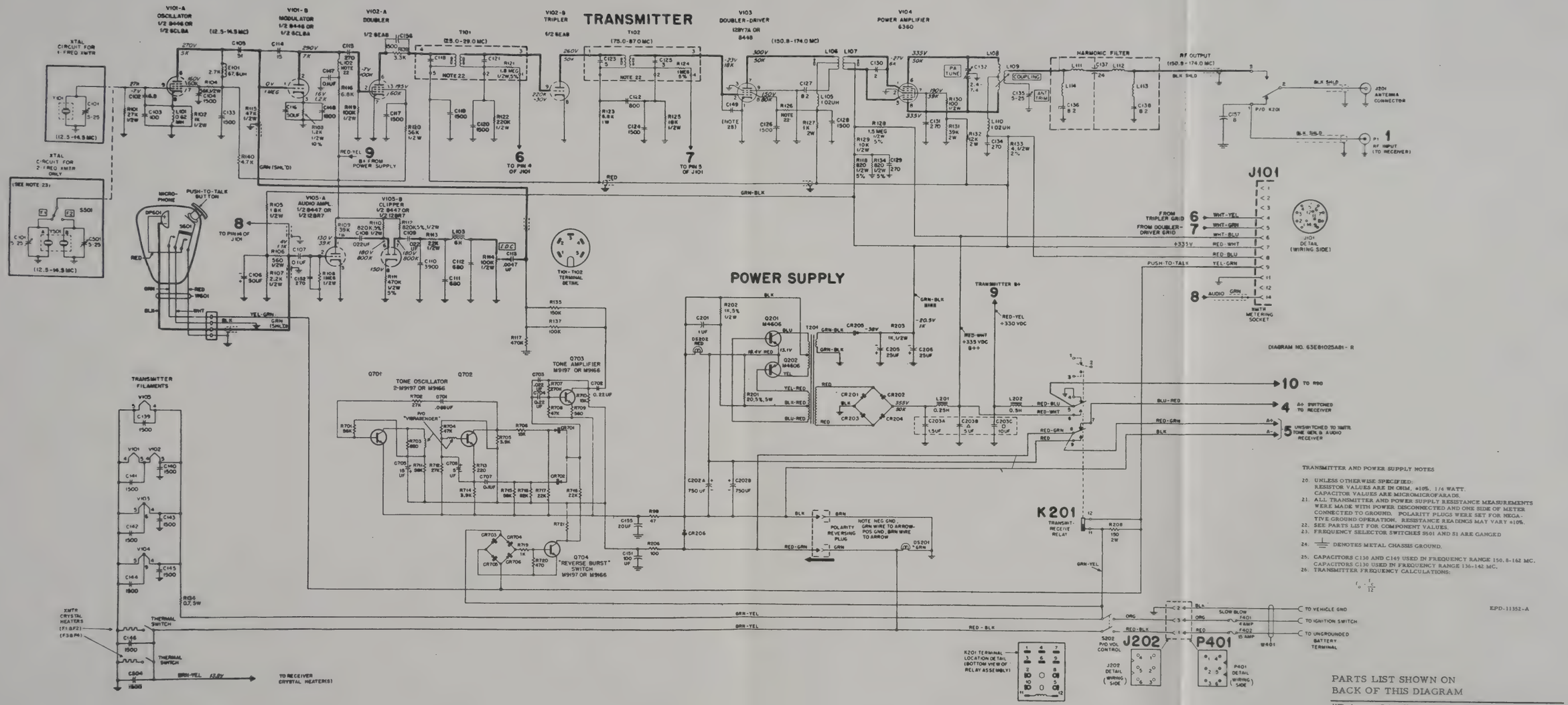
   150.8-174 MC $f_o = \frac{f_c - 5.5\ MC}{4}$

   136-150.8 MC $f_o = \frac{f_c + 5.5}{4}$

EPD-10163-A

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON FRONT OF THIS DIAGRAM

"Private-Line" Tone Squelch Radio Set
Schematic Diagram
Motorola No. 63E81025A81-R
(Sheet 1 of 2)
5/2/67-GM



TRANSMITTER AND POWER SUPPLY NOTES

20. UNLESS OTHERWISE SPECIFIED:
    RESISTOR VALUES ARE IN OHM, ±10%, 1/4 WATT.
    CAPACITOR VALUES ARE MICROMICROFARADS.
21. ALL TRANSMITTER AND POWER SUPPLY RESISTANCE MEASUREMENTS WERE MADE WITH POWER DISCONNECTED AND ONE SIDE OF METER CONNECTED TO GROUND. POLARITY PLUGS WERE SET FOR NEGATIVE-GROUND OPERATION. RESISTANCE READINGS MAY VARY ±10%.
22. SEE PARTS LIST FOR COMPONENT VALUES.
23. FREQUENCY SELECTOR SWITCHES S501 AND S1 ARE GANGED
24. ⏚ DENOTES METAL CHASSIS GROUND.
25. CAPACITORS C130 AND C149 USED IN FREQUENCY RANGE 150.8-162 MC. CAPACITORS C130 USED IN FREQUENCY RANGE 136-142 MC.
26. TRANSMITTER FREQUENCY CALCULATIONS:

$f_o = \frac{f_c}{12}$

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

"Private-Line" Tone Squelch Radio Set
Schematic Diagram
Motorola No. 63E81025A81-R
(Sheet 2 of 2)
5/2/67-GM

DESCRIPTION
EPD-12339-B
CAPACITOR, fixed: uuf;
inl. stated
1 uf
lual sect; c/o:
□ 750 uf +100-0%; 25 v
△ 750 uf +100-0%; 25 v
sect; c/o:
1.5 uf +50-10%; 450 v
5 uf +50-10%; 450 v
10 uf +50-10%; 450 v
5 uf +150-10%; 50 v
EMICONDUCTOR DEVICE,
iode: (NOTE I)
ilicon
ilicon
ilicon
AMP, incandescent:
8 volt; 0.15 amp; type 1445
ONNECTOR, receptacle:
ingle contact; does not incl.
5A483599 HOOD, connector
ncl 14C82544D01 BODY
9C82336A01 CONTACT; 6 req'd
ELAY, armature:
low release; 3 form "C"; coil
es 40 ohms ±10%
EACTOR:
.25 h; res 63 ohms ±20%
5 h; res 185 ohms ±10%
RANSISTOR: (NOTE I)
-N-P; type M4606 does not
cl. 14K865875 INSULATOR;
ansistor mounting
ESISTOR, fixed: ±10%; 1/2 w
l stated
±5%; 5 w
±5%
0K
0; 1/4 w
0; 2 w
VITCH,
ide: dpdt
st; Part of R66
ANSFORMER, power:
i: YEL, BLU with BLK
nter tap feedback; YEL-RED,
U-RED with BLK-REDcenter
sec (h.v.): RED, RED sec
v.): GRN-BLK, GRN-BLK
MPHOLDER:
gle cont; min; bay. type;
1 mounting clip
CKET, transistor:
ontact

TLN6957A Tone Generator — EPD-11881-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uf; 25 v;
C701	8D82905G04	.068 ±10%
C702, 704	8D82905G11	0.22 ±10%
C703	8D82905G02	.022 ±10%
C705	23K865136	15 ±20%
C706	23D82601A11	5 +33-10%
C707	8D82905G07	0.1 ±10%
		SEMICONDUCTOR DEVICE, diode: (NOTE I)
CR701, 702	48C82392B03	silicon
CR703, 704, 705, 706	48C82921G01	germanium
		TRANSISTOR: N-P-N: (NOTE I)
Q701, 702, 703, 704	48K869197 or 48R869166	M9197 M9166
		RESISTOR, fixed: ±10%; 1/2 w;
R701, 711, 715	6R6378	56K
R702, 712	6R6434	27K
R703	6R6040	680
R704, 708	6R6048	47K
R705, 714	6R5659	3.9K
R706, 710	6R6477	15K
R707	6R6414	270K
R709	6R6291	560
R713	6R6270	220
R716	6S5644	82K
R717, 718	6S6397	22K
R719	6R6229	1K
R720	6R6090	470
R721	6R6080	4.7K
NON-REFERENCED ITEM		
	9C83035A01	SOCKET, "Vibrasender" unit: female; 4 contact

TMN6019A Microphone (MK601) — EPD-11882-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
DP601	59C82933C01 or59D82817C01	CARTRIDGE, microphone: incl. pre-amplifier
S601	40C82326G01	SWITCH, push dpst; does not incl 38A852699 BUTTON, push
W601	1V80711A94	CORD, microphone: incl 30K852742 CORD, coiled; tinsel; 4 cond. 41A852707 SPRING, strain relief 29A847033 LUG, term.: 4 req'd 29A847034 LUG, term.: 4 req'd
NON-REFERENCED ITEMS		
	1V80720A94	HOUSING ASSY. (rear)
	15D82701B01	HOUSING (front)
	42A852710	STRAP
	32A82703B01	GASKET, microphone
	42B82702B01	RETAINER, cartridge
	1V865398	MICROPHONE MOUNTING KIT: incl 64A85596 PLATE, support 3S122830 SCREW, tapping: #8 x 1/2"; 2 req'd

TKN6100A Cable Kit — EPD-11883-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		FUSE, cartridge:
F401	65K834464	4 amp; 125 v; slow-blow type
F402	65S4165	15 amp; 32 v
		CONNECTOR, plug:
P401		(p/o 30C82545D01) incl in W401
		CABLE ASSEMBLY, power
W401	1V80720A54	incl. F401, 402 and the following items 1V80720A55 CABLE ASSY; incl; 30C82545D01 CABLE AND PLUG ASSY.; (P401) 42A82884A01 CLIP, fuseholder 2 req'd 14A82883A01 CAP, fuseholder 2 req'd 1V80720A56 LEAD AND LUG ASSY: incl 30K868999 LEAD, electrical: #14 ga. str. BLK; 8 ft req'd 29B82607B02 LUG, ring tongue; for 5/16" stud 1V80717A08 LEAD AND FUSEHOLDER ASSY: incl 10M343 WIRE, electrical: #18 ga. str. ORG; 50" req'd 42A82884A01 CLIP, fuseholder 14A82882A01 BODY, fuseholder 41A82885A01 SPRING, fuse-holder: 29K824456 LUG; ring tongue: for #10 stud 1V80711A78 LEAD AND FUSEHOLDER ASSY: incl 30B82724C01 LEAD, electrical #14 ga. str.; RED 79" req'd 42A82884A01 CLIP, fuseholder 14A82882A01 BODY; fuseholder 41A82885A01 SPRING, fuse-holder; 29B82607B03 LUG, ring tongue; for 3/8" stud 43K867963 SLEEVE, connector

TLN6473A Adapter Kit — EPD-11884-A

	28A48250	ADAPTER, right angle; single contact; coaxial type

NOTES:

I Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

II When ordering crystal units, specify carrier frequency, crystal frequency and crystal type number.

REDUCTION OF INTERFERING NOISES IN MOBILE OPERATION

1. INTRODUCTION

Noise generated by the electrical system of the vehicle, as well as local ambient noise, may interfere with normal operation of two-way mobile radios. To overcome these interferences, various noise reduction procedures are required. These requirements vary from one vehicle to another, depending on the frequency of the system, the type of vehicle used, as well as the area the system is expected to cover. If the area to cover is sufficiently small so that signal levels may always be high, less noise reduction is required. Conversely, for maximum range coverage and operation into weak signal areas, noise reduction becomes very important.

Before attempting any noise reduction procedures determine the noise source, then, follow a systematic method of elimination until the interference is removed, or appreciably reduced.

2. NOISE REDUCTION KIT

The Model TLN6252A Noise Reduction Kit is available for all vehicles equipped with two-way radios. This kit is supplied with all Motorola 25-54 mc radio sets because the noise problem is more severe on the 25-54 mc band than it is on other higher frequencies. However, this kit may be obtained as an accessory item for other radio sets if desired. Refer to figure 4 for a typical noise reduction installation.

Noise reduction techniques for unusual or acute cases are outlined in paragraph 9 of this section.

3. GENERAL INFORMATION

Split-channel commercial two-way equipment is more susceptible to impulse noise interference. Impulse noise is most noticeable in installations of narrow bandwidth receivers because of the steep sided selectivity characteristics and not because of the method of obtaining the selectivity.

The useful range of split-channel two-way radio communications equipment can be seriously affected by noise interference, which prevents the reception of a clear easily understandable signal. A certain amount of noise interference may be tolerated when operating in a strong signal area or when operating a short distance from the station. However, in weak signal areas such as fringe area operation, serious noise interference can cause a complete failure in the reception of the station signal.

However, for more efficient use of the frequency spectrum, it is necessary to reduce receiver acceptance bandwidths. As these acceptance bandwidths become smaller the noise problems become greater.

4. NOISE SOURCE

The source of noise can generally be determined by its sound in the speaker. For best results in locating noise, the unit should be receiving a weak signal which produces not less than 10 db nor more than 30 db noise quieting.

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Issue - J

TRANSMITTER — EPD-12338-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf: unl stated
C101, 501	20K859643	var; 5-25; NP0
C102	21K865469	6.8 ±0.25; 500 v; N330
C103	21K850118	100 ±5%; 500 v
C104, 117, 119, 120, 124, 126, 128, 133, 139, 140, 141, 142, 143, 144, 145 146, 148, 156	21B800801	1500 GMV; +100%; max; 500 v
C105	21K840711	51 ±5%; 500 v
C106, 116	23C82601A05	50 uf +150-10%; 25 v
C107	21C82372C03	0.1 uf +80-20%; 25 v
C108	8K852472	.022 uf ±10%; 200 v
C109	8K863322	.022 uf ±10%; 400 v
C110	21K837996	3900 ±10%; 500 v
C111, 112	21K865452	680 ±10%; 500 v
C113	8K857303	.0047 uf ±10%; 100 v
C114	21K840846	15 ±5%; 500 v; NP0
C115, 129, 131, 134	21C82187B04	270 ±10%; 500 v
C118, 121	21K847874	12 ±5% (150.8-174 mc)
	or21K848525	16 ±5%; 500 v (136-150.8 mc)
C122	21K847070	800 ±10%; 600 v
C123	21D82355B01	5 ±5%; 500 v; N470 (150.8-174 mc)
	or21K851681	8 ±0.5; 500 v; N470 (136-150.8 mc)
C125	21K832520	3 ±25%; 500 v; N470 (150.8-174 mc)
	or21K851681	8 ±0.5; 500 v; N470 (136-150.8 mc)
C127	21D82355B12	8.2 ±5%; 500 v; N470
C130	21K857336	2 ±.25; 500 v; NP0 (136-142 mc & 150.8-162 mc)
C132	19B847063	var; 7.4-2.4
C135	20C82109C02	var; 5-25; NP0
C136, 138	21K865357	8.2 ±5%; 500 v; NP0
C137	21K857335	feed-thru; 24 ±5%; 500 v; N080
C147	8K858371	0.1 uf ±10%; 400 v
C149	21K868935	3 ±.25; 2000 v; NP0 (150.8-162 mc)
C150	8K864428	0.1 uf ±10%; 100 v
C152	21K847085	270 ±10%; 300 v
C153	8D82905G07	0.1 uf ±10%; 25 v
C155	23D82601A03	20 uf +100-0%; 25 v
C157	21K847743	8 ±0.5 uuf; 500 v; NP0
E101	24A838456	SUPPRESSOR, parasitic
J101	9C857358	CONNECTOR, receptacle: female; 12 contact
L101	24K864737	COIL, RF: choke: .62 mh
L102	24D82480B02	choke; 16 uh (150.8-174 mc)
	or24C82000E06	choke; 33 uh; sleeved (136-150.8 mc)
L103	25C82697C01	choke; splatter; 6 h
L105, 110	24V80900A86	choke; 1.02 uh; ins.
L106	24A82468D01	plate; doubler-driver (150.8-174 mc)
	or24A82468D02	plate; doubler-driver (136-150.8 mc)
L107	24A82467D01	grid; PA (150.8-174 mc)
	or24A82467D02	grid; PA (136-150.8 mc)
L108	24V80900A88	plate; tank; incl ref part L110 (150.8-174 mc)
	or24V80901A64	plate; tank; incl ref part L110 (136-150.8 mc)
L109	1V80716A26	output; coupling loop (150.8-174 mc)
	or1V80721A68	output; coupling loop (136-150.8 mc)
L111, 112	24A82749C01	harmonic; 2 turns
L113, 114	24A82748C01	harmonic; 1 turn
		RESISTOR, fixed: ±10%; 1/2 w unl stated
R98	6R5550	47
R101	6S6434	27K
R102	6S6229	1K
R103	6R6166	1.2K
R104, 120	6S6378	56K
R105	6R2089	1.8K
R106	6R6291	560
R107	6R6069	2.2K
R108, 138	6R6046	1 megohm
R109	6R5588	39K; 1 w
R110, 112	6S5773	820K; ±5%
R111	6S5795	470K ±5%
R113	6R6397	22K
R114	18K855906	var; 100K; incl. mtg. hdwe.
R115	6S6048	47K
R116	6R6429	6.8K
R117	6S6371	470K
R118, 134	6R119172	820 ±5%
R119, 137	6S6031	100K
R121	6R401017	1.8 megohm ±5%
R122	6S6407	220K
R123	6S5691	6.8K; 1 w
R124	6R5587	1 megohm ±5%
R125	6S5591	18K
R126	6R6400	33K; 1 w (150.8-174 mc)
	or 6R6402	56K; 1 w (136-150.8 mc)
R127	6R3922	1K; 2 w
R128	6R400228	1.5 megohm ±5%
R129	6R6320	10K
R130	6R6326	100
R131	6R5731	39K; 2 w
R132	6R5766	12K; 2 w
R133	6K854261	4 ±2%
R135	6S6398	150K
R136	17C82177B12	0.7, 5 w
R139	6R5581	3.3K
R140	6R6080	4.7K
S501	40C82838C01	SWITCH, rotary: single pole; 2 position; non-shorting
T101	24V80900A87	TRANSFORMER, RF: doubler; BV2; incl. ref parts C118, 121, R121, and (2) 1A82354B03 CORE, tuning (150.8-174 mc)
	or24V80901A65	doubler; CA8; incl. ref parts C118, 121, R121 and (2) 1A82354B03 CORE, tuning (136-150.8 mc)
T102	24B82750C01	tripler; BV3; incl. ref parts C123, 125, R124 and (2) 1A82354B03 CORE, tuning (150.8-174 mc)
	or24B82750C02	tripler; CA9; incl. ref parts C123, 125, R124 and (2) 1A82354B03 CORE, tuning (136-150.8 mc)
V101	97R132A01	ELECTRON TUBE: 8446
	or 95T324A01	6CL8A
V102	95R270A04	6EA8
V103	97R133A01	8448
	or65A83735A02	12BY7A
V104	97T126A01	6360A
V105	95R351A01	8447
	or 95T258A01	12BR7
XV101, 102, 103, 104, 105	9K867359	SOCKET, tube: 9 contact
XY101	9C855941	SOCKET, crystal 6 contact
Y101	ZNN-3A	CRYSTAL, quartz: (NOTE II) 1-freq. operation
Y501	ZNN-3-3A	2-freq. operation

NON-REFERENCED ITEMS

	1V80711A86	RADIATOR ASSY, incl 15D82754C01 HOUSING, radiator 26A82305A03 SHIELD heat, dissipator; 3 req'd. 41A82755C01 SPRING, housing: 2 req'd.; 3A857308 SCREW FILLISTER HEAD: 4 req'd. 3S122518 LOCKSCREW: 4-40 x 3/16"; 4 req'd
	64D82766C01	PANEL, front
	13B82776C01	GRILLE, speaker
	32B82775C01	GASKET, speaker grille
	61A82720C01	LENS, indicator: RED
	61A82720C02	LENS, indicator: GRN
	55A82082D01	LOCK, front panel: incl (2) 55K893872 KEY

POWER SUPPLY — EPD-12339-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf; unl. stated
C201	8K859592	1 uf
C202	23D82125B07	dual sect; c/o: □ 750 uf +100-0%; 25 v △ 750 uf +100-0%; 25 v
C202A C202B C203 C203A C203B C203C	23D82178B06	3 sect; c/o: 1.5 uf +50-10%; 450 v △ 5 uf +50-10%; 450 v □ 10 uf +50-10%; 450 v
C205, 206	23C82601A08	25 uf +150-10%; 50 v
CR201, 202, 203, 204	48C82466H02	SEMICONDUCTOR DEVICE, diode: (NOTE I) silicon
CR205	48C82466H01	silicon
CR206	48C82525G01	silicon
DS201, 202	65C82010C02	LAMP, incandescent: 18 volt; 0.15 amp; type 1445
J201	9C85615	CONNECTOR, receptacle: single contact; does not incl. 15A483599 HOOD, connector
J202	1V80731A53	incl 14C82544D01 BODY 29C82336A01 CONTACT; 6 req'd
K201	80D82593D03	RELAY, armature: slow release; 3 form "C"; coil res 40 ohms ±10%
L201	25C82038D01	REACTOR: 0.25 h; res 63 ohms ±20%
L202	25B82803C01	0.5 h; res 185 ohms ±10%
Q201, 202	48R134606	TRANSISTOR: (NOTE I) P-N-P; type M4606 does not incl. 14K865875 INSULATOR; transistor mounting
R201	17C82177B07	RESISTOR, fixed: ±10%; 1/2 w unl stated 20 ±5%; 5 w
R202	6R6411	1K ±5%
R203	6R6229	1K
R204	6S6031	100K
R206	6K129753	100; 1/4 w
R208	6R3991	150; 2 w
S201	40B82713C01	SWITCH, slide: dpdt
	or40B82073D01	
S202		dpst; Part of R66
T201	25D83261D01	TRANSFORMER, power: pri: YEL, BLU with BLK center tap feedback; YEL-RED, BLU-RED with BLK-RED center tap sec (h.v.): RED, RED sec (l.v.): GRN-BLK, GRN-BLK
XDS201, 202	9B82778C01	LAMPHOLDER: single cont; min; bay. type; incl mounting clip
XQ201, 202	9B82673A01	SOCKET, transistor: 2 contact

TLN6957A Tone Generator — EPD-11881-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C701	8D82905G04	CAPACITOR, fixed: uf; 25 v; .068 ±10%
C702, 704	8D82905G11	0.22 ±10%
C703	8D82905G02	.022 ±10%
C705	23K865136	15 ±20%
C706	23D82601A11	5 +33-10%
C707	8D82905G07	0.1 ±10%
CR701, 702	48C82392B03	SEMICONDUCTOR DEVICE, diode: (NOTE I) silicon
CR703, 704, 705, 706	48C82921G01	germanium
Q701, 702, 703, 704	48K869197 or 48R869166	TRANSISTOR: N-P-N: (NOTE I) M9197 M9166
R701, 711, 715	6R6378	RESISTOR, fixed: ±10%; 1/2 w; 56K
R702, 712	6R6434	27K
R703	6R6040	680
R704, 708	6R6048	47K
R705, 714	6R5659	3.9K
R706, 710	6R6477	15K
R707	6R6414	270K
R709	6R6291	560
R713	6R6270	220
R716	6S5644	82K
R717, 718	6S6397	22K
R719	6R6229	1K
R720	6R6090	470
R721	6R6080	4.7K

NON-REFERENCED ITEM

	9C83035A01	SOCKET, "Vibrasender" unit: female; 4 contact

TMN6019A Microphone (MK601) — EPD-11882-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
DP601	59C82933C01 or59D82817C01	CARTRIDGE, microphone: incl. pre-amplifier
S601	40C82326G01	SWITCH, push dpst; does not incl 38A852699 BUTTON, push
W601	1V80711A94	CORD, microphone: incl 30K852742 CORD, coiled; tinsel; 4 cond. 41A852707 SPRING, strain relief 29A847033 LUG, term.: 4 req'd 29A847034 LUG, term.: 4 req'd

NON-REFERENCED ITEMS

	1V80720A94	HOUSING ASSY. (rear)
	15D82701B01	HOUSING (front)
	42A852710	STRAP
	32A82703B01	GASKET, microphone
	42B82702B01	RETAINER, cartridge
	1V865398	MICROPHONE MOUNTING KIT: incl 64A85596 PLATE, support 3S122830 SCREW, tapping: #8 x 1/2"; 2 req'd

TKN6100A Cable Kit — EPD-11883-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F401	65K834464	FUSE, cartridge: 4 amp; 125 v; slow-blow type
F402	65S4165	15 amp; 32 v
P401		CONNECTOR, plug: (p/o 30C82545D01) incl in W401
W401	1V80720A54	CABLE ASSEMBLY, power incl. F401, 402 and the following items 1V80720A55 CABLE ASSY; incl; 30C82545D01 CABLE AND PLUG ASSY.; (P401) 42A82884A01 CLIP, fuseholder 2 req'd 14A82883A01 CAP, fuseholder 2 req'd 1V80720A56 LEAD AND LUG ASSY: incl 30K868999 LEAD, electrical: #14 ga. str. BLK; 8 ft req'd 29B82607B02 LUG, ring tongue; for 5/16" stud 1V80717A08 LEAD AND FUSEHOLDER ASSY: incl 10M343 WIRE, electrical: #18 ga. str. ORG; 50" req'd 42A82884A01 CLIP, fuseholder 14A82882A01 BODY, fuseholder 41A82885A01 SPRING, fuseholder: 29K824456 LUG; ring tongue: for #10 stud 1V80711A78 LEAD AND FUSEHOLDER ASSY: incl 30B82724C01 LEAD, electrical #14 ga. str.; RED 79" req'd 42A82884A01 CLIP, fuseholder 14A82882A01 BODY; fuseholder 41A82885A01 SPRING, fuseholder; 29B82607B03 LUG, ring tongue; for 3/8" stud 43K867963 SLEEVE, connector

TLN6473A Adapter Kit — EPD-11884-A

	28A48250	ADAPTER, right angle; single contact; coaxial type

NOTES:

I Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

II When ordering crystal units, specify carrier frequency, crystal frequency and crystal type number.

REDUCTION OF INTERFERING NOISES IN MOBILE OPERATION

1. INTRODUCTION

Noise generated by the electrical system of the vehicle, as well as local ambient noise, may interfere with normal operation of two-way mobile radios. To overcome these interferences, various noise reduction procedures are required. These requirements vary from one vehicle to another, depending on the frequency of the system, the type of vehicle used, as well as the area the system is expected to cover. If the area to cover is sufficiently small so that signal levels may always be high, less noise reduction is required. Conversely, for maximum range coverage and operation into weak signal areas, noise reduction becomes very important.

Before attempting any noise reduction procedures determine the noise source, then, follow a systematic method of elimination until the interference is removed, or appreciably reduced.

2. NOISE REDUCTION KIT

The Model TLN6252A Noise Reduction Kit is available for all vehicles equipped with two-way radios. This kit is supplied with all Motorola 25-54 mc radio sets because the noise problem is more severe on the 25-54 mc band than it is on other higher frequencies. However, this kit may be obtained as an accessory item for other radio sets if desired. Refer to figure 4 for a typical noise reduction installation.

Noise reduction techniques for unusual or acute cases are outlined in paragraph 9 of this section.

3. GENERAL INFORMATION

Split-channel commercial two-way equipment is more susceptible to impulse noise interference. Impulse noise is most noticeable in installations of narrow bandwidth receivers because of the steep sided selectivity characteristics and not because of the method of obtaining the selectivity.

The useful range of split-channel two-way radio communications equipment can be seriously affected by noise interference, which prevents the reception of a clear easily understandable signal. A certain amount of noise interference may be tolerated when operating in a strong signal area or when operating a short distance from the station. However, in weak signal areas such as fringe area operation, serious noise interference can cause a complete failure in the reception of the station signal.

However, for more efficient use of the frequency spectrum, it is necessary to reduce receiver acceptance bandwidths. As these acceptance bandwidths become smaller the noise problems become greater.

4. NOISE SOURCE

The source of noise can generally be determined by its sound in the speaker. For best results in locating noise, the unit should be receiving a weak signal which produces not less than 10 db nor more than 30 db noise quieting.

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Noise interference is usually traced to one of the following sources.

a. Impulse noise interference generated by the vehicle electrical system. This type of interference is generated by the commutator action, vibration of electrical contacts and electrical arcing or sparking. This broad-band interference may be propagated via space radiation.

The impulse noise enters the receiver through the antenna and serious interference in the form of tuned circuit "ringing" results even though the impulse may be very brief. "Ringing" may be defined as the shock excitation of a tuned circuit caused by an impulse which extends the duration of the impulse. It is this "ringing", caused by the impulse rather than the impulse itself, which is objectionable.

b. Noise produced by fluorescent lights, electric motors, electric fences, induction from power lines and similar sources is generally AM in nature, excluding capture effect. Normally, all such noise is removed from a received carrier by effective limiting action. Also, a vehicular radio is able to move out of a high noise level area if this type of noise interferes with reception. Thus, such conditions may be tolerated.

NOTE

Thermal agitation noise and noise produced in the receiver, as well as ripple in the power supply, have been taken into consideration in the original design of the equipment. Any well designed mobile radio unit will not present any serious problems in this respect.

5. IGNITION NOISE

An automobile electrical system provides the primary source of electrical interference to radio communications in mobile installations. Electrical interference can be generated in the spark plugs, distributor contacts, generator armature, voltage regulator, electrical gauges, wheel static and any part of the car where friction may exist due to intermittent contact between any two members of the car's mechanical structure.

In a mobile installation, the prime source of electrical interference with radio communications is in most cases the result of a spark discharge or are created in the electrical system. Whenever a spark discharge takes place through air, high frequency oscillations are generated in a range of frequencies from a few kilocycles to hundreds of megacycles. These oscillations are generally radiated, however, they may be picked up by associated wiring and transferred to other electrical wiring in the system including that of the radio installation.

The problem of suppressing all the arcing that can develop in the electrical system may be difficult. For example, in an 8 cylinder engine operated at 2000 RPM, arcing in the engine system can be at the rate of 8,000 sparks per minute or 133 per second. These arcs after being extended because of ringing, can create a blanket of noise blocking out weak signals at the radio receiver and only the very strongest are able to overcome such an obstacle.

6. THE IGNITION SYSTEM

In order to effectively reduce ignition interference in a car, it is well to understand the operation of an automobile ignition system.

Ignition is necessary in a gasoline engine to ignite the gasoline vapor and the air mixture in its cylinders. The system is made up of the battery, distributor, breaker points, coil, condenser and spark plugs. The 6 or 12 volt battery is the only electrical source of power in an automobile. Therefore, its low voltage must be stepped up to the high voltage necessary to develop an arc across the electrode of the spark plugs. This arc ignites the gas mixture.

The electrical circuit arrangement is accomplished by a mechanical circuit breaker (points in the distributor) which opens the primary circuit of the ignition coil. By transformer action in the coil, high voltage is developed at the coil secondary. This high voltage is applied and synchronized to each spark plug by means of the distributor.

The battery is connected to the primary winding of the coil through the ignition switch. The primary circuit is completed back to the battery through the breaker points, which are bypassed by the condenser. The points are normally closed. As the cam shaft is rotated by the engine, its lobes or corners open and close the points in proper synchronization with each cylinder.

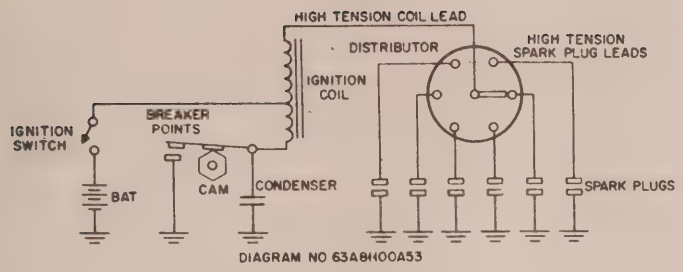

Figure 1. Ignition Circuit

With the ignition switch on and the breaker points closed, the primary current in the coil cannot build up rapidly, due to the self-inductance of the primary coil.

When the breaker points open, the primary current decreases almost instantly and an EMF is produced in the primary by self-induction, which is many times greater than the battery voltage. Also, when the breaker points open, the condenser reduces arcing of the points. Because of the stepped up ratio, the high voltage induced in the coil secondary causes a spark across the spark plug gap for a short interval of time.

The secondary circuit of the ignition coil, with the spark gap, is much like a spark transmitter used in the early days of radio. It is the heart of the ignition interference. All that is needed is an inductance and capacity in series with the spark gap. The lead inductance and stray capacity provides this tuned circuit. Because the discharge of the circuit is through a low resistance (ionized spark gap), the circuit tends to oscillate. The frequency of oscillation and the amplitude that is developed varies as the current changes in the spark gap. This oscillation in the high tension leads develop r-f currents which can interfere with the radio reception.

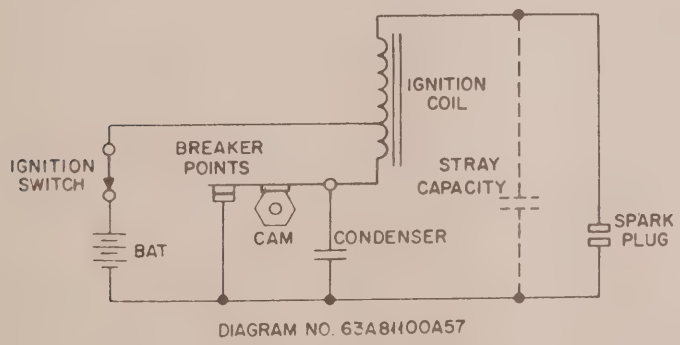

Figure 2. Simplified Ignition Circuit

7. NOISE REDUCTION TECHNIQUE

It has long been known by ignition engineers that the addition of a series resistance adjacent to a spark discharge will serve to damp out the troublesome oscillation which causes interference. The types of spark plug suppression consistent with good engine performance to be applied in noise reduction should always be in accordance with the recommendations of the car manufacturer, i.e., if spark plugs are to be replaced with built-in suppressor types, they should be in the proper heat ranges and thread sizes for the particular engine. If resistance wire is used, the length may be critical so as not to exceed the total permissible resistance to be added. In addition to spark plug suppressors or resistance wire, and economical basic kit of noise reduction items can consist of the following: special coaxial capacitors, combinations of resistor and capacitor assemblies and hood wiper springs.

NOTE

In all cases where coaxial capacitors are mentioned, they should not be replaced by standard bypass capacitors. The standard bypass displays a resonance effect with high attenuation, at about 2 megacycles. The coaxial type is non-inductive and has high attenuation, up into the uhf region.

The importance of such noise reduction items is greatly increased by their application at the right terminal points in the cars electrical system. Following is an outline of the important points to be considered and a step by step procedure in ignition noise reduction.

NOTE

Noise reduction can only be achieved if components are properly grounded. BE SURE THAT ALL CAPACITORS AND THE GENERATOR FIELD SUPPRESSOR ASSEMBLY ARE PROPERLY GROUNDED.

In the development of a noise reduction kit, it was not necessary to include a resistance cable in the wiring harness. One or the other of such items is generally found as a standard part of present day motor vehicles. However, the absence of such items from a basic noise kit is not to be misconstrued as being non-essential to noise reduction. Spark plug noise reduction is one of the most essential points to be covered in all cases.

a. Generator Interference

The generator is a source of electrical interference which is frequently blamed on the ignition system. Electrical current passing between the brushes and commutator in the generator creates many small arcs as the armature rotates. Generator noise is characterized by a high pitched "whine" and varies with engine speed. A .5 uf coaxial capacitor should be placed in series with the generator armature to reduce interference.

NOTE

If the vehicle is supplied with an alternator, the capacitor is not necessary.

b. Voltage Regulator Interference

The modern voltage regulator is a precise mechanism containing three separate control systems operating with breaker contacts. Vibrating breaker contacts cause arcing which may result in annoying interference. This interference is usually noted in the form of erratic popping in the receiver which changes only slightly in frequency with increase in engine speed.

To reduce voltage regulator hash noise, two .5 uf coaxial capacitors and a resistor-capacitor assembly are used (see figure 4).

CAUTION

Disconnect the ground battery terminal from the battery before attempting to add any components to the battery terminal of the voltage regulator.

c. Ignition Coil Interference

A .1 uf coaxial capacitor should be placed at the BAT side of the ignition coil to eliminate impulses from the low voltage leads (refer to figure 4).

d. Distributor Interference

Sparking in the distributor itself is a source of radio interference. As the rotor rotates in the cap, sparking occurs between the rotor and the distributor cap inserts. To reduce the interference, a length of radio ignition wire connecting the ignition coil to the distributor cap has proven most effective.

NOTE

Some vehicles are equipped with radio ignition wire. Disregard replacement instructions in these instances.

e. Battery Connection

Connecting the radio's primary power lead directly to the battery instead of the starter relay can help to keep noise off the "A" lead. The battery acts as a large capacitor (about 1 farad for 50 amp capacity batteries) bypassing noise to ground. This large capacitor serves as a very effective bypass. The battery ground return should also be bounded to the frame. Utilizing the car frame as a common ground as much as practical, tends to minimize the possibility of inducing undersirable parallel ground currents.

f. Hood Wipers

Ground returns for the electrical circuits are provided through the body and frame of the automobile. Differences in conductivity, inadequate bonds between adjacent conductors and unequal current distributions result in potential differences throughout the vehicle. The miniature arcs created by these potential differences can be avoided by eliminating the potential differences. Effective use of copper bonding braid and brass contact wipers as hood bonds will minimize interference from this source.

8. NOISE BALANCING IN RECEIVERS

Noise balancing a receiver may result in an appreciable amount of noise reduction. However, this method alone may not reduce all the apparent ignition noise.

It is characteristic of an FM receiver, that, at one point in the alignment, a null point in impulse noise response will be reached. This null may vary from installation to installation. As the unit leaves the factory, the receiver is tuned to the exact operating frequency and is adjusted for proper noise balance. However, if it is found necessary to noise balance the receiver at some future date (as the set ages) or in some specific installation, the following procedure should be used.

Adjustment should be made with the receiver installed in the vehicle and the engine running.

a. Turn the equipment "on" and allow it to warm-up for at least five minutes.

b. Adjust the volume to a normal listening level.

c. Radiate a signal on the frequency of the receiver. The signal can originate from a Motorola portable test set with a built-in crystal controlled peaking generator and correct channel crystal, from a signal generator, or from a distant transmitter.

The receiver should be on frequency. The receiver signal should be just strong enough to produce 10 to 30 db quieting.

d. Start the vehicle and let the engine idle.

e. Connect the portable test set to the receiver metering receptacle.

f. Place the selector switch of the test set in position 2.

g. If adjustment of the second mixer coil does not prove effective, adjust any one of the first i-f coils until ignition noise is substantially reduced. The first i-f coils are very sensitive and may only be adjusted a very slight amount without reducing receiver gain. When making ignition noise balance adjustments, do not decrease the meter reading more than one-half microampere.

h. If satisfactory reduction of audible noise cannot be obtained by the methods previously described, the secondary winding of the discriminator is probably not aligned to exactly 455 kc. Align the discriminator as described in the receiver alignment procedures of the instruction manual.

9. ADDITIONAL NOISE REDUCTION TECHNIQUES

In some radio installations it may be necessary to obtain maximum noise reduction. In such installations the following possible source of noise interference should be explored and remedy applied.

a. Ammeter to battery lead. (Bypass with .5 uf capacitor. Motorola part #8A821889.)

b. Gauges, oil signal, gasoline and temperature. (Bypass with .5 uf capacitor. Motorola part #8A821889.)

c. Ignition switch. (Bypass with .5 uf capacitor. Motorola part #8A821889.)

d. Headlight, tail light or dome light leads. (Bypass with .5 uf capacitor. Motorola part #8A821889.)

e. Accessory wiring, electrical windshield wipers, heater motor, window openers and others. (Bypass with .5 uf capacitors. Motorola part #8A821889.)

f. Wheel static. (Use wheel static collector rings on both front wheels. Motorola part numbers 1K534254 Regular Type: 1K563173 Small Type.)

g. Acute cases of generator noise. (Install a .5 uuf capacitor in series with the armature lead. Motorola Part No. 8A821889.)

h. For severe cases of ignition interference, Hallett Ignition Shielding Kits, shown in figure 3, are available through Motorola on separate order. These special shielded harnesses are available for most automobile and truck engines, providing improved communication in fringe areas and essentially waterproofing the ignition system. Supply the following information when ordering Hallett Ignition Shielding Kits.

1. Make and year of vehicle
2. Auto or truck and number of cylinders
3. Engine cubic inch displacement
4. Type of ignition system; Auto-Lite, Chrysler, etc.

NOTE

Fire truck engine shielding requires more detailed information to assist in supplying the proper kit. Write first for the special "fire truck shielding form" from your nearest Motorola Parts Depot.

i. A generator-regulator shield is available to further reduce generator and regulator noise. It is not required on alternator equipped vehicles. Follow the same ordering procedure when requesting this item.

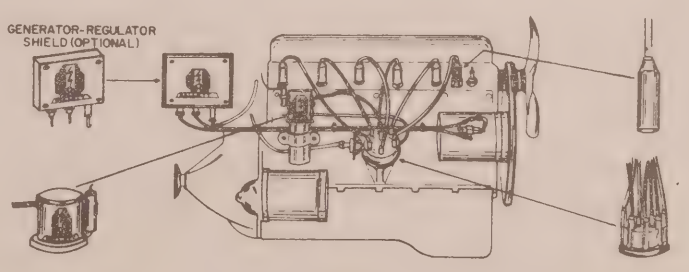

Figure 3.

10. CONCLUSION

The level to which ignition noise interference will need to be reduced will depend on the environmental conditions of operation of the radio system. The factors involved are the strength of the received carrier at various points within range of the fixed station, and the clarity of signals at the fringe areas. However, in most cases ignition noise interference can be substantially reduced resulting in optimum performance of the radio equipment under most operating conditions.

The reduction of ignition noise interference, in many cases, is essential to good system performance. Therefore, it must be given full consideration in the initial installation of the radio equipment. The components required to successfully reduce ignition noise interference may well prove to be an essential part of the communications system. Indeed, no installation of mobile radio can be complete unless the remedy for bothersome ignition noise interference has been successfully applied at the time of installation.

Specific noise sources may be isolated to some extent, under specific conditions. When the vehicle is standing still with the ignition switch off, any noise heard will probably be external to the vehicle. Static discharge noise will be added when the vehicle is moving with the ignition switch off. If the vehicle is coasting in gear, with the ignition switch off, generator noise will be added to the others, if present. Noise produced by inadequate bonding will be most noticeable when maximum current is being drawn from the battery, and may be increased when the vehicle is in motion. Care should be used to be sure that noise tests are made both with and without weak signals. Also, for radio sets which include a squelch control, care should be used to check with control in the unsquelched or maximum sensitivity condition.

The use of a coaxial flexible lead, with a probe pick up loop about one inch in diameter, connected to a separate powered radio set or oscilloscope and used as a search wand to find the hottest areas, has been found to be most useful.

It is impossible to give an exact procedure to counteract noise in all cases; too many variables exist. With an understanding of some of the sources of noise, an intelligent approach will often save considerable time. Ignition noise reduction can add to both operational efficiency and operator satisfaction.

NOISE IDENTIFICATION AND REDUCTION CHART

Characteristics of Noise at Speaker	Source of Noise	How to Check Source of Noise	How to Reduce Noise
Identified as popping sound	Ignition	Noise varies in frequency with engine speed and will disappear when ignition is switched off.	1. Check to be sure: (a) Distributor breaker points are in good condition. (b) Ignition capacitor is in good condition. (c) All ignition system connections are free of corrosion & making good contact. (d) There is d-c continuity in high voltage leads. (e) There are sufficient high spark plug break-down voltages. (f) Spark plug electrodes are properly spaced and in good condition. 2. Bond each corner of the motor block to chassis ground using a heavy copper grounding braid. 3. Damp the high voltage by installing a resistor suppressor in the distributor rotor lead, or suppressors in the ignition cables or on top of the spark plugs. 4. Install resistor spark plugs or resistance ignition cables.
Identified as a high pitched whine	Generator	Noise varies with engine speed and will persist if ignition is switched off while engine is running at a moderate speed.	Install a .5 uf coaxial capacitor at the generator in series with the armature lead.

NOISE IDENTIFICATION AND REDUCTION CHART (Cont'd)

Characteristics of Noise at Speaker	Source of Noise	How to Check Source of Noise	How to Reduce Noise
Identified as raspy sound	Voltage Regulator	Look for arcing voltage regulator contacts.	Install .5 uf coaxial capacitors, Motorola Part Number 8A821889 at the battery (BAT.) terminal in series with the battery lead and at the generator (ARM) terminal in series with the armature lead. Install RC Filter (1V80700A89) composed of a 3.3 ohm resistor in series with a .002 uf capacitor (Maximum allowable capacity) in series with the field (F) terminal of the voltage regulator to a common ground.
Identified as a hissing or crackling sound	Gauges	Noise may be detected by jarring the individual gauges while the ignition is on.	Install .5 uf bypass capacitors where needed. (Motorola part #8A821889)
Identified as a low-pitch clicking sound	Oil Sender	Noise rate varies with oil pressure and stabilizes at point of maximum oil pressure.	Install .5 uf bypass capacitor (Motorola Part Number 8A821889) from gauge lead terminal on Oil Sender to chassis ground.
Identified as an irregular popping sound	Wheel Static	Noise disappears when brakes are lightly applied.	Install suitable grounding brushes or springs such as front wheel static eliminators (Motorola Part Number 1K534254 regular type, 1K563174 small type).
Identified as a more regular or sharper popping sound	Tire Static	Noise becomes much worse at 30-50 mph.	Use anti-static powder in tires with inner tube.

11. KIT COMPLEMENT

Reference Number	Quantity	Motorola Part Number	Description
1	3	1V839913	Lead & Lug Assembly
2	1	1V80700A88	Lead & Lug Assembly
3	1	8C82571B02	Capacitor, Coaxial (.1 uf - 100 V)
4	3	8C82571B01	Capacitor, Coaxial (.5 uf - 100 V)
5	1	1V80700A89	Generator Field Suppressor Assembly
6	1	30A502396	Ignition Coil Suppressor Cable
7		1V80700A91	Hood Wipers and Mounting Kit Hardware

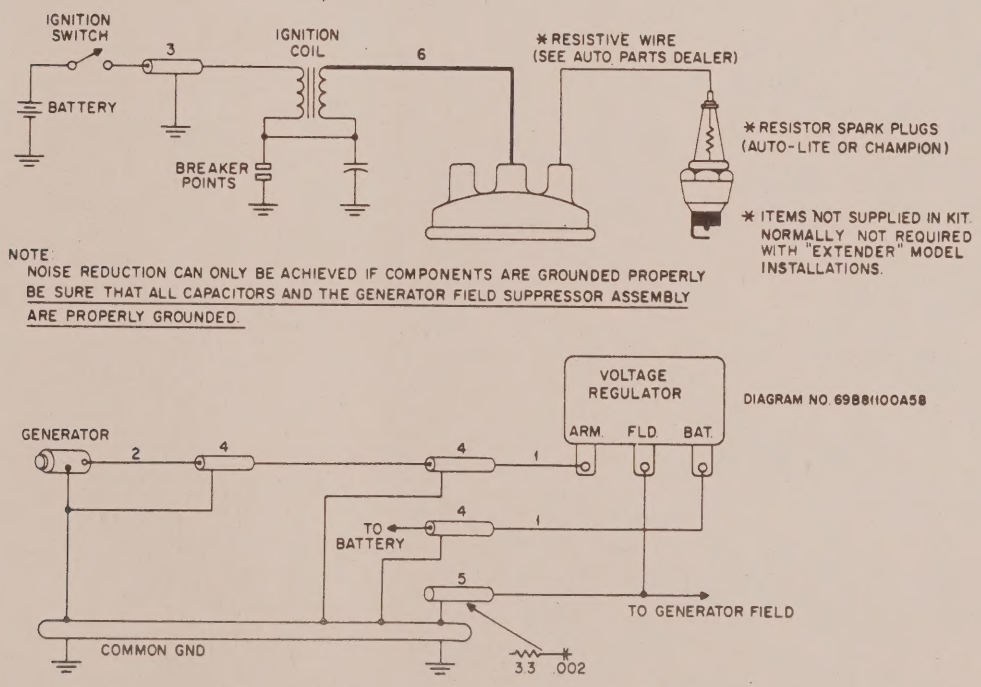

Figure 4.
Typical Noise Reduction Detail